SCIENCE

THE MAIN BOOK

2023

FIRST TERM

BY A GROUP OF SUPERVISORS

Interactive E-learning Application

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SERIES



Contents

UNIT 1

Matter and its Construction



Lesson **1**	Matter and its Characteristics.
Lesson **2**	Matter Construction.
Lesson **3**	Atomic Structure of Matter.

Unit Objectives :

By the end of this unit, students will be able to :

- Identify the physical and chemical properties of matter.
- Classify a group of materials according to their physical and chemical properties.
- Appreciate the importance of senses in identifying the physical properties of matter.
- Prove by an activity the properties of molecules.
- Identify the concept of element and compound.
- Compare the molecule of an element to the molecule of a compound according to the atomic structure.
- Identify the concept of an atom and its structure.
- Design a model of the atom to show its structure.
- Conclude the relation between the atomic structure and the chemical properties of the atom.
- Design some models of the structure of molecules of some materials.
- Identify the electronic configuration in an atom.
- Design a model of an electronic configuration of an atom.
- Mention the symbols and chemical formula of some materials.
- Conclude the fact that an atom is the building unit of all materials.
- Appreciate the glory of God in creating a countless number of different materials.
- Appreciate the role of scientists and their scientific discoveries in the field of the matter structure.

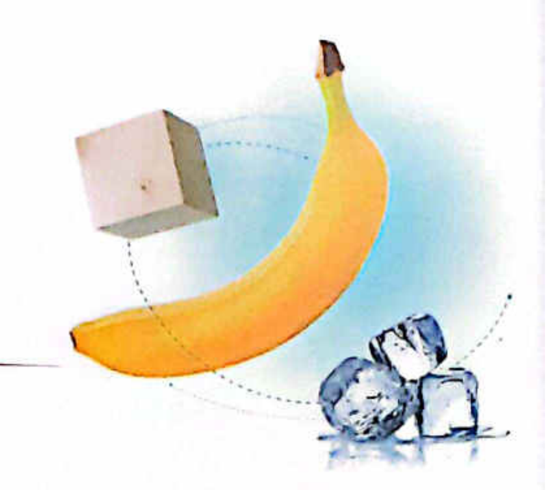
LESSON 1

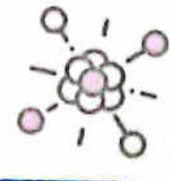
Matter and its Characteristics



What is meant by matter?

- Everything around us on the Earth's surface is called **Matter**.
- Any matter has a mass and a volume.





Matter
It is anything that has a mass & a volume.
or It is anything that has a **mass** and **occupies a space**.

Mass
It is the amount of matter that the body contains.
The measuring unit of mass is **gm** or **kg**.

Volume
It is the space that is occupied by the body.
The measuring unit of volume is cm^3, m^3 or **L**.

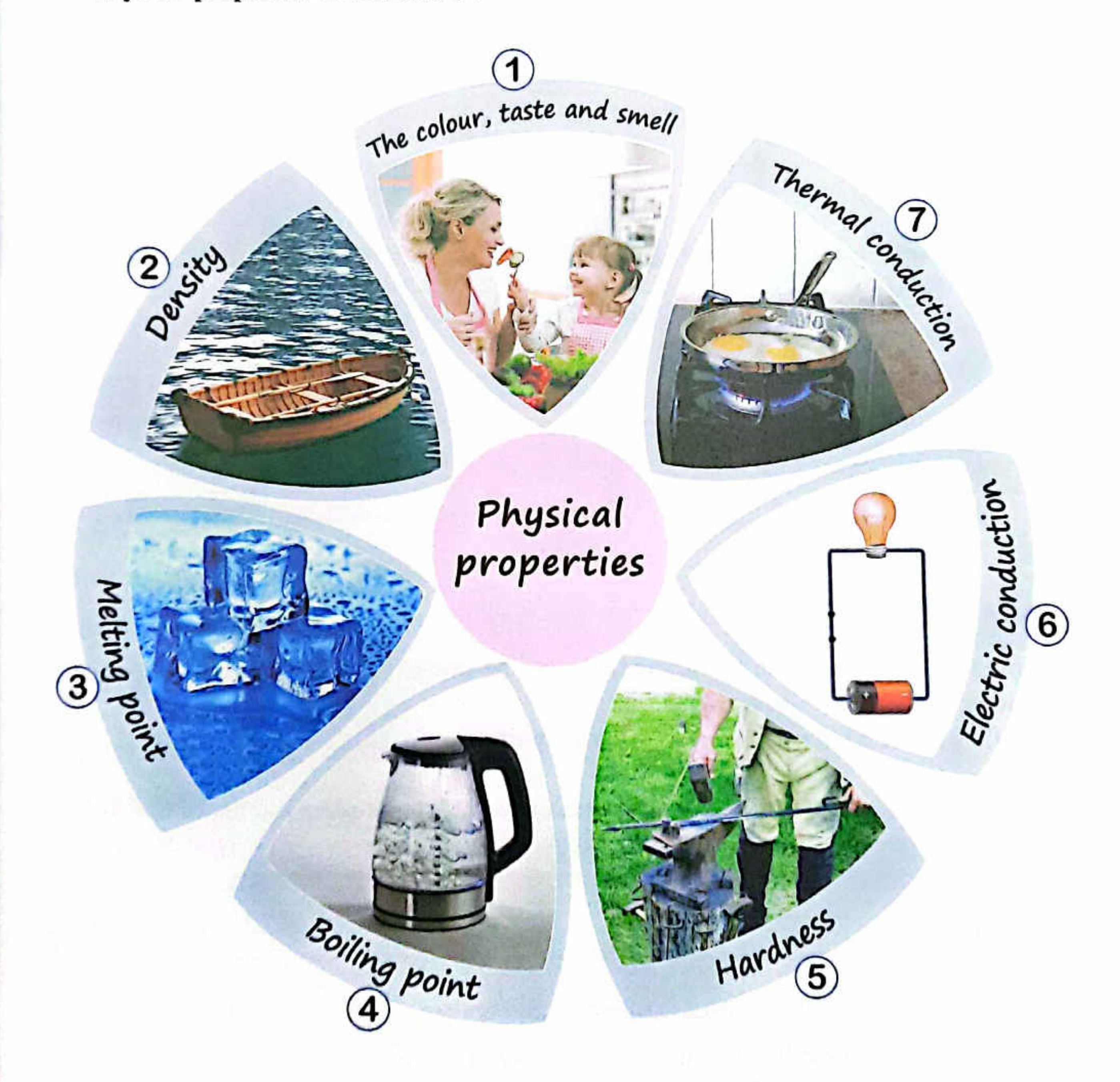
Properties of matter

• Matter can be distinguished from each other by :

First : Physical properties. **Second :** Chemical properties.

FIRST Physical properties

- **Physical properties of matter are :**



1 The colour, taste & smell

Some materials can be distinguished by colour, taste or smell, for example :



Note

Some substances have no colour, no taste and no smell
such as: • water • oxygen gas
but they differ from each other in other properties.

Warning: Don't taste or smell any substance in the lab. without asking your teacher first **G.R.**
Because some substances may harm you.

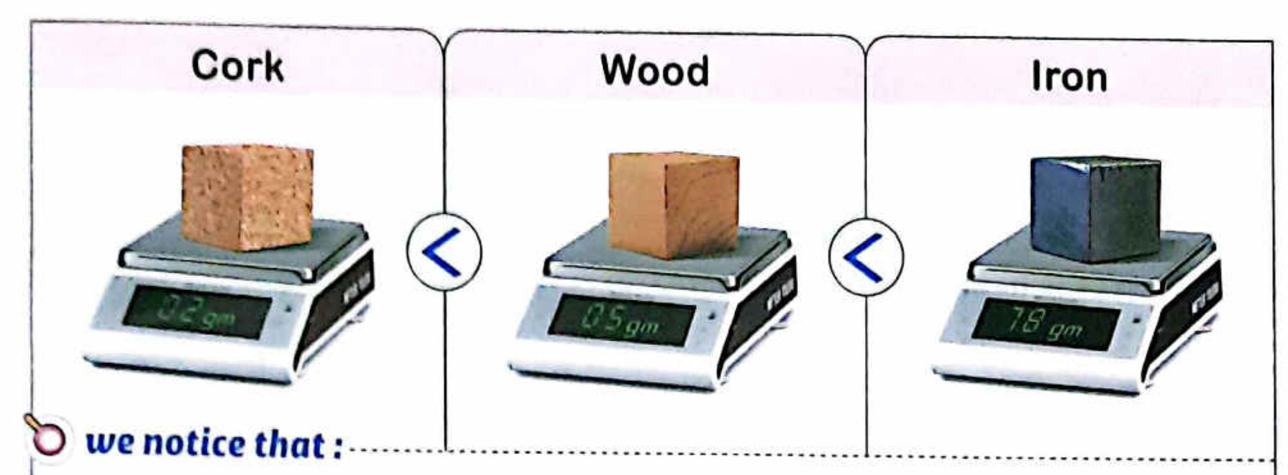
Question

Complete :

1. The taste property is the distinguishing factor between .... and ....
2. You can distinguish between gold and silver by their different ....

2 Density

Look at the following figures that show the mass of equal volumes of different substances :



we notice that :

The **mass** of 1 cm^3 of cork **is smaller than** the **mass** of 1 cm^3 of wood

The **mass** of 1 cm^3 of wood **is smaller than** the **mass** of 1 cm^3 of iron

This is due to the difference in density.

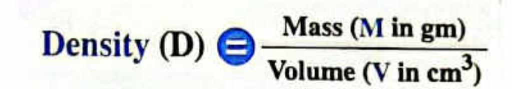
Density

It is the mass of unit volume of a substance.

or

It is the mass of one cubic centimetre of a substance.

The measuring unit of density is gm/cm^3.



$$\text{Density (D)} = \frac{\text{Mass (M in gm)}}{\text{Volume (V in cm}^3\text{)}}$$

What is meant by ...?

The density of water is 1 gm/cm^3.

➲ This means that the mass of 1 cm^3 of water equals 1 gm.

Question



Complete :

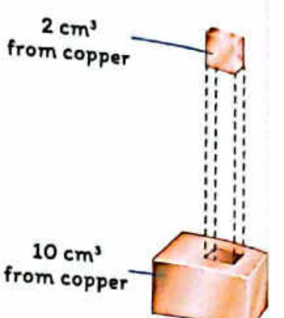
1. The density is the .... of unit volume of a substance and its measuring unit is ....
2. Density = ...

Notes

- ***The density of a matter is a fixed value, whatever the used volumes or masses differ.***

Example

The density of a cube of copper, whose volume 2 cm^3 is the same density of another cube of copper, whose volume is 10 cm^3.



What happens when ...?

Decreasing the volume of a body to half "according to its density".

The density remains constant.

- ***Each substance has its own density.***

i.e. There aren't two substances have the same density, therefore

- Equal masses of different substances have different volumes **G.R.**
- Equal volumes of different substances have different masses **G.R.**

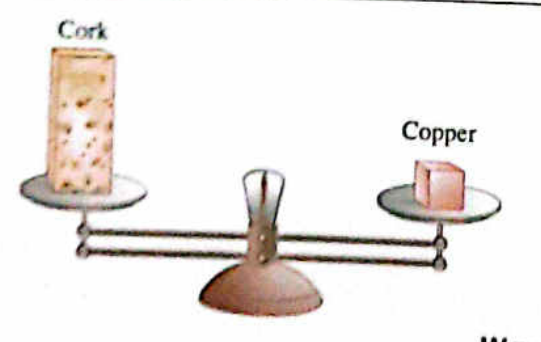
Due to the difference in density.

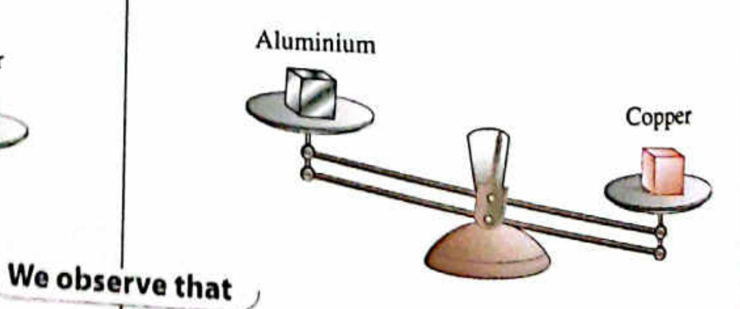
Example

From the following two tables

Substance	Copper	Cork
Mass (gm)	10	10
Volume (cm^3)	1.136	50

Substance	Copper	Aluminium
Mass (gm)	8.8	2.7
Volume (cm^3)	1	1





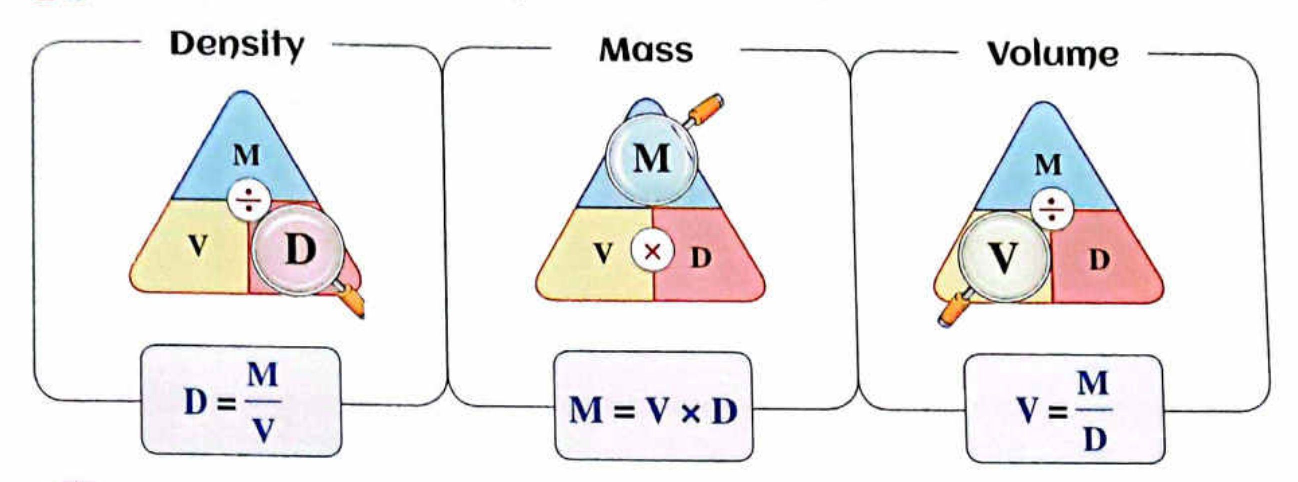
We observe that

The volume of copper cube **is smaller** than the volume of cork cube, although they have the same mass **G.R.**

The mass of copper cube **is larger** than the mass of aluminium cube, although they have the same volume **G.R.**

Due to the difference in density.

To calculate the Density , Mass and Volume :



Problems

1 ***Calculate the density of a substance, whose mass is 35 gm and its volume is 25 cm^3.***

Solution

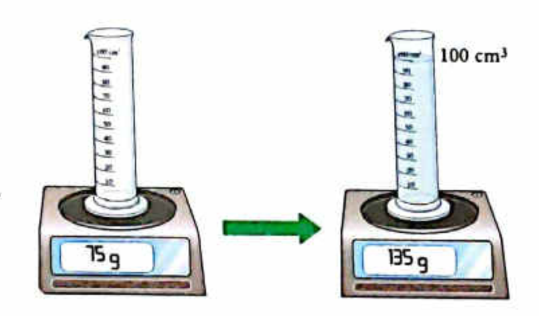
$$\text{Density (D)} = \frac{\text{Mass (M)}}{\text{Volume (V)}} = \frac{35}{25} = 1.4 \text{ gm/cm}^3.$$

---

2 ***In an experiment for determining the density of a liquid, the following results are recorded :***

- The mass of an empty cylinder = 75 gm.
- The mass of the cylinder containing liquid = 135 gm.
- The volume of the liquid = 100 cm^3.

- **Calculate the density of the liquid.**



Solution

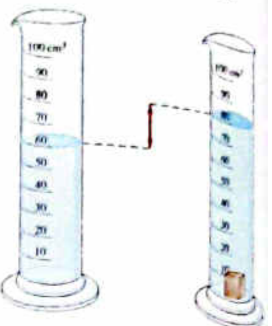
- The mass of the liquid
 = The mass of the cylinder containing liquid – The mass of the empty cylinder
 = 135 – 75 = 60 gm.

- The density of the liquid $= \frac{\text{Mass}}{\text{Volume}} = \frac{60}{100} = 0.6 \text{ gm/cm}^3$.

NB When a solid body submerged in a known volume of water, the amount of increase in the volume of water is equal to the volume of the solid body.

The volume of a solid body = Volume of water and solid body – Volume of water

3 ***On determining iron density using a piece of iron whose mass is 156 gm, the iron piece is immersed in 60 cm³ of water, the water rises up to 80 cm³. Find the density of iron.***



Solution

- The volume of the iron piece
  = The volume of water and the piece of iron − The volume of water = $80 - 60 = 20$ cm³.
- The density of iron = $\frac{\text{Mass}}{\text{Volume}} = \frac{156}{20} = 7.8$ gm/cm³.

The relation between floating or sinking of matter in water and density

The matter of low density floats on that of high density as shown in the following activity.

Activity 1 • To compare between the density of some substances and the density of water :

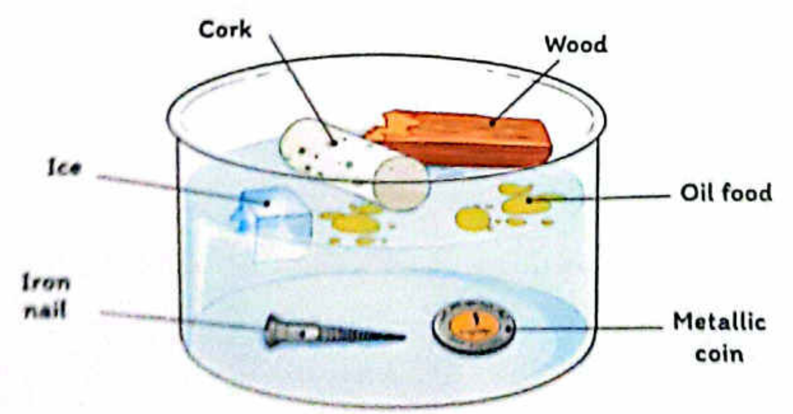
Step:

Put the following substances in a basin containing water.

- A piece of wood.
- An iron nail.
- A piece of ice cube.
- Drops of oil food.
- A piece of cork.
- A metallic coin.

Observations:

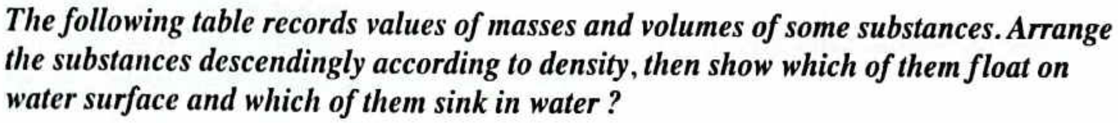
- The iron nail and the metallic coin sink in water.
- The piece of wood, cork, ice and the drops of oil float on water surface.



Conclusions:

- Materials which have **higher density** than water **sink** in it such as an iron nail and a metallic coin.
- Materials which have **lower density** than water **float** on its surface such as wood, cork, ice and drops of oil.

Question



The following table records values of masses and volumes of some substances. Arrange the substances descendingly according to density, then show which of them float on water surface and which of them sink in water ?

Substance	Water	Iron	Petrol oil	Red copper	Cork
Mass (gm)	50	31.2	82	22	5
Volume (cm^3)	50	4	100	2.5	25

Life applications of density

1 Water is not used to put out (extinguish) petrol fires G.R.

Because the density of petrol is less than that of water so, petrol floats on water surface and water doesn't put out the petrol fires.



2 Balloons filled with hydrogen or helium rise up in the air carrying flags during festivals G.R.

Because the densities of hydrogen and helium are less than the density of air.





For illustration only

Substance	Hydrogen	Helium	Air
Density (gm/cm^3)	0.00009	0.00017	0.00129

3 The change in the density of matter is used to check the purity of matter G.R.

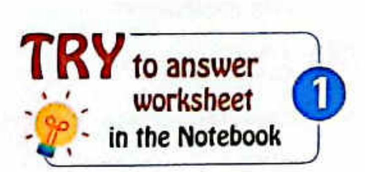
Because each matter has its own density therefore the change in the density value of any substance indicates its impurity.



Example :

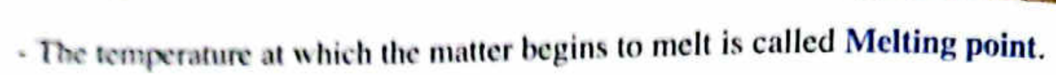
Determination of the quality of natural milk knowing that the density of milk is 1.03 gm/cm^3 that by determination of the volume and the mass of milk then calculate its density, If the density of milk differs from 1.03 gm/cm^3 the milk is impure (duped).





3 Melting point

- Matter exists in three states which are solid, liquid and gaseous.
- The change of matter from solid state to liquid state by heating is known as **Melting**.



- The temperature at which the matter begins to melt is called **Melting point**.



Melting point

It is the temperature at which matter begins to change from a solid state to a liquid state.

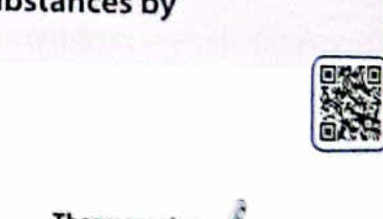
What is meant by ...?

The melting point of ice = 0°C.

➲ This means that ice begins to change into water at 0°C.

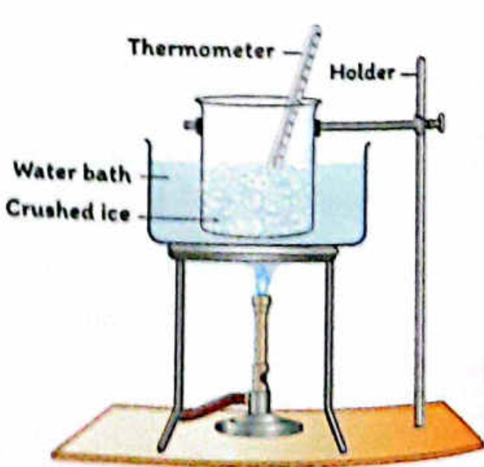
* ***Each solid substance has a definite melting point which is used to differentiate between different substances.***

Activity 2 • To differentiate between different substances by the point of fusion (melting point) :



Steps:

1. Put a beaker containing crushed ice and a thermometer in a water bath.
2. Put the water bath on a flame for a period of time.
3. When the ice starts to melt, remove the flame and record the thermometer reading.
4. Replace the crushed ice by wax and repeat the previous steps.



Observation:

The melting point of ice is less than that of wax.

Conclusion:

Each substance has a definite melting point.

- **Substances can be classified according to melting points into :**

Substances have low melting points

Such as :

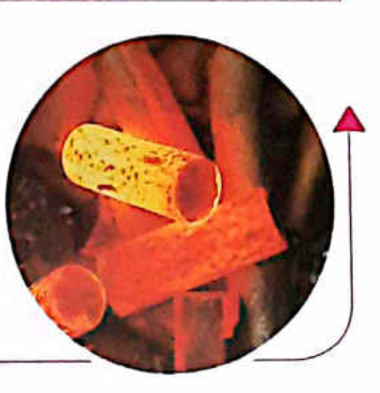
- Wax.
- Butter.
- Ice.



Substances have high melting points

Such as :

- Iron.
- Copper.
- Aluminium.
- Table salt.



Life applications *of melting point :*

1 Cooking pans (pots) are made up of aluminium or stainless steel alloy which don't rust G.R.

Due to their high melting point.



2 Workmen melt the solid metals G.R.

To be easy for mixing and shaping to form alloys as :

- **Copper-gold alloy** that is used in making jewels.



- **Nickel-chrome alloy** that is used in making heating coils.



4 Boiling point



- The change of matter from liquid state to gaseous state by heating is known as **Boiling**.
- The temperature at which the matter begins to boil is called **Boiling point**.

Boiling point

It is the temperature at which matter begins to change from a liquid state to a gaseous state.

What is meant by ...?

The boiling point of water = 100°C.

➲ This means that water begins to change into water vapour at 100°C.

* ***Each liquid substance has a definite boiling point which is used to differentiate between different substances.***



Life application of boiling point :

The separation of the components of crude petroleum oil by heating G.R.

Due to the difference between them in their boiling points.

Question

Who Am I :

1. Substance that has a high melting point. (..................)
2. Alloy that is used in making jewels. (..................)

Choose :

1. Solid substance whose melting point is 1500 °C, starts to change into liquid at .... °C.

   a. 1000 b. 1500 c. 1550 d. 2000

2. Stainless steel is a type of ....

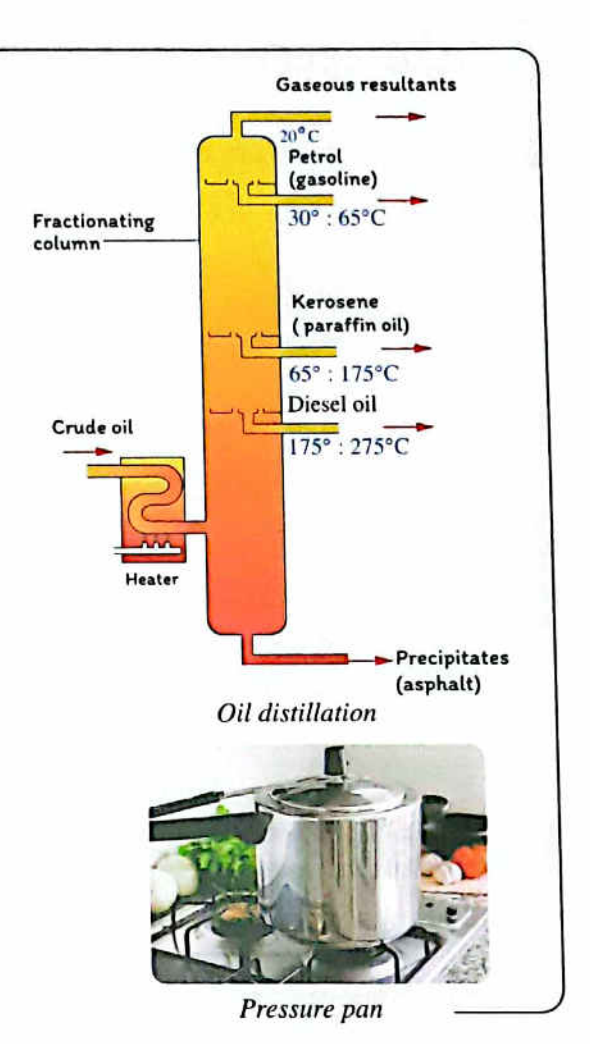
   a. alloys. b. salts. c. plastic. d. acids.

▸ Enrichment information

* **The separation of the components of crude oil** can be done by heating the crude oil, then separating each substance at its boiling point.

* **Boiling point** is the temperature at which the vapour pressure of the substance is equal to the atmospheric pressure, so when pressure increases, the boiling point increases.

* **Pressure pans** are used for fast cooking as they raise the pressure so, boiling point increases and food is cooked faster.

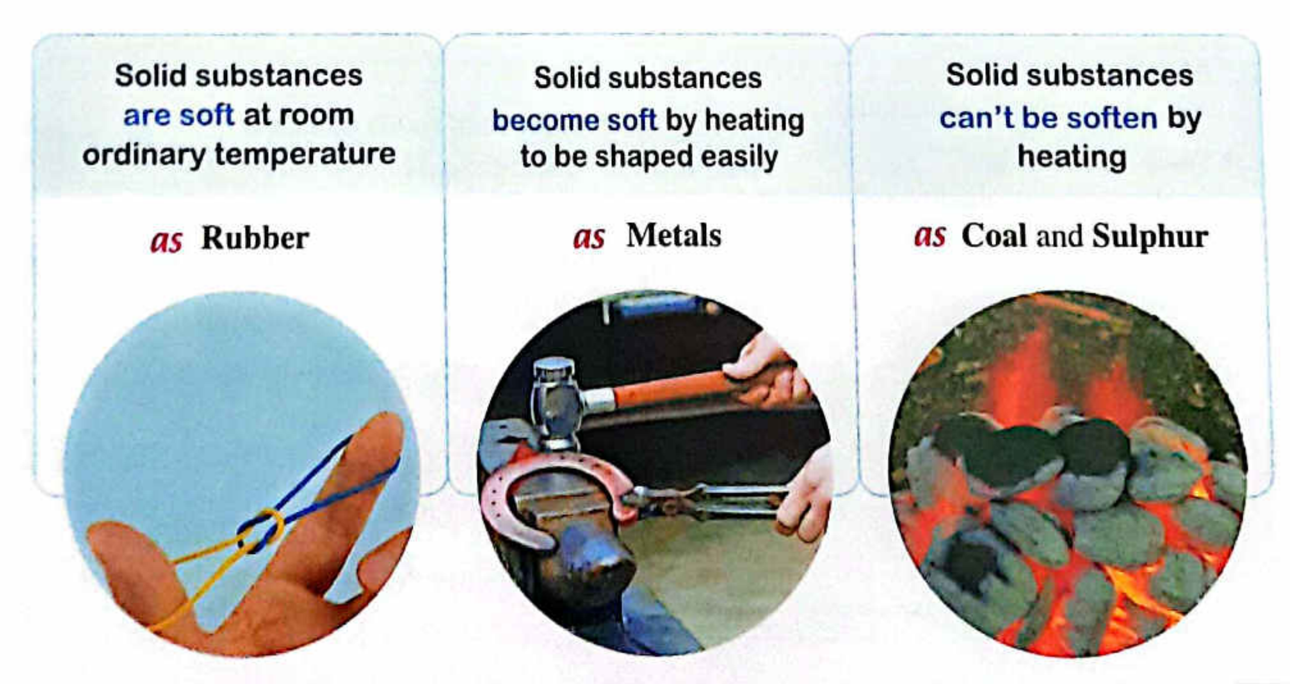


Oil distillation

Pressure pan

5 Hardness

- **Solid substances are divided according to hardness into :**



Life applications of hardness :

1 **The screwdrivers are made up of steel iron G.R.**

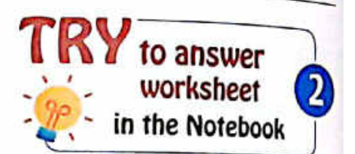
Because it is very hard.



2 **The rods used in building concrete houses are made up of iron not copper G.R.**

Because the hardness of iron is more than that of copper.

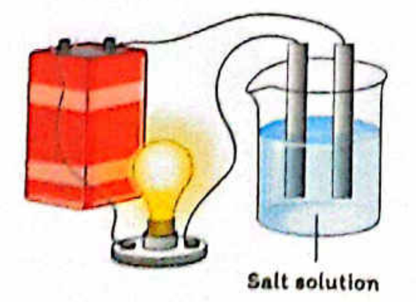


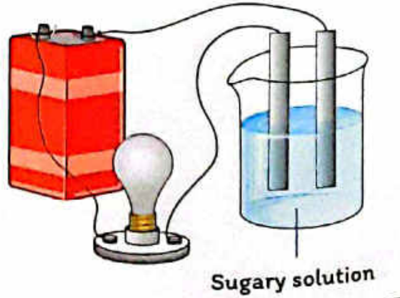


6 Electric conduction

- **Substances can be classified according to electric conduction into :**

Good conductors of electricity	**Bad** conductors of electricity
Substances allow electricity to flow through.	*Substances don't allow electricity to flow through.*
Examples	
• *Metals as* : Iron, silver, copper, aluminium, ...	• *Gases.*
• *Some solutions as :* Acidic solutions, alkaline solutions and some salt solutions.	• *Some solid substances as* : Sulphur, phosphorus, wood and plastic.
	• *Some solutions as :* - Solution of hydrogen chloride in benzene. - Sugary solution.



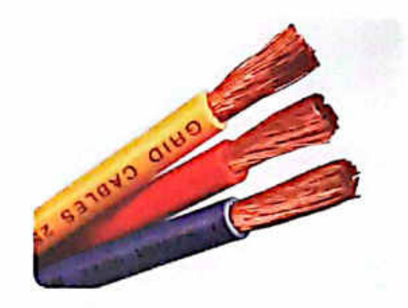




Life applications of electric conduction :

1 Electric wires (or cables) are made up of copper or aluminium and covered with a plastic layer G.R.

Because both of copper and aluminium are good conductors of electricity, while plastic is a bad conductor of electricity.



2 Electric screwdrivers are made up of steel iron, while their handles are made up of wood or plastic G.R.

Because steel iron is a good conductor of electricity, but wood and plastic are bad conductors of electricity.



7 Thermal conduction

- **Substances can be classified according to thermal conduction into :**

Good conductors of heat	Bad conductors of heat
Substances allow heat to flow through.	*Substances don't allow heat to flow through.*
Examples	
Metals such as **iron**, **copper**, **aluminium**, ...	**Wood** and **plastic**.



Life applications of thermal conduction :

1 Cooking pans are made up of aluminium G.R.

Because aluminium is a good conductor of heat and it has a high melting point.

2 Handles of cooking pans are made up of wood or plastic G.R.

Because wood and plastic are bad conductors of heat.



Question

Choose from column (B) & (C) what suit them in column (A) :

(A)	(B)	(C)
1. Copper	a. is hard to be shapped	A. because it is bad conductor of heat.
2. Rubber	b. is used in making handles of cooking pans	B. because it is good conductor of electricity.
3. Sulphur	c. is used in making heating coils	C. because its hardness is low.
4. Wood	d. is used in making electric wires	D. because it is bad conductor of electricity.
	e. is soft at room ordinary temperature	E. because it can't be soften by heating.

SECOND Chemical properties

Metals and chemical activity

Metals can be classified according to their chemical activity into three groups :

A Very active metals :

They are metals which react with oxygen when they are exposed to humid air, so they lose their metallic luster.

➲ Examples : **Sodium and potassium.**

Life application of chemical activity :

Sodium and potassium are kept under kerosene surface G.R.

To prevent their reaction with atmospheric oxygen.



Keeping sodium under kerosene

B Less active metals :

They are metals which react with oxygen if they are left in air for some days forming a layer of rust.

➲ Examples : **Iron, aluminium and copper.**

Life applications *of chemical activity :*



1 Steel bridges and the holders of light bulbs are painted from time to time G.R.

To protect them from rust and corrosion.



2 Metallic spare parts of cars are covered with grease G.R.

To protect them from rust and corrosion.



3 Aluminium cooking pans are washed with a rough material G.R.

To remove the rust layer formed on their surfaces.

C Inactive metals :

They are metals which find great difficulty in reacting with oxygen.

➲ Examples : **Silver, platinum, nickel, gold and chromium.**

Life applications *of chemical activity :*



1 Silver, gold and platinum are used in making jewels G.R.

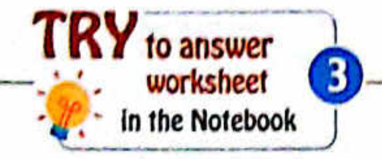
Because they are chemically poor active.

so, they keep their luster for long time.



2 Nickel, gold and silver are used to cover other substances which rapidly gain rust such as iron G.R.

To protect them from rust and corrosion.



Remember Lesson One



Matter :

- It is anything that has a mass and a volume (occupies a space).

Mass :

- It is the amount of matter that the body contains.
- Its measuring unit is **gm**.

Volume :

- It is the space that is occupied by the body.
- Its measuring unit is **cm^3**.

Properties of matter

A Physical properties

1. The colour, taste and smell.

- They are properties that can sometimes be used to differentiate between different materials.

2. Density :

- It is the mass of unit volume of a substance.

Or

- It is the mass of one cubic centimetre of a substance.
- Its measuring unit is **gm/cm^3**.

$$\text{Density (D)} = \frac{\text{Mass (M)}}{\text{Volume (V)}}$$

3. Melting point :

- It is the temperature at which matter begins to change from a solid state to a liquid state.

4. Boiling point :

- It is the temperature at which matter begins to change from a liquid state to a gaseous state.

5. Hardness :

Solid substances are divided according to hardness into :

- Solid substances are **soft** at room ordinary temperature as **Rubber**.
- Solid substances **become soft** by heating to be shaped easily as **Metals**.
- Solid substances **can't be soften** by heating as **Coal** and **Sulphur**.

6. Electric conduction :

- **Good conductors of electricity :**

  Ex.: Metals as iron, silver, copper, aluminium and some solutions as acidic solutions, alkaline solutions and some salt solutions.

- **Bad conductors of electricity :**

  Ex.: Gases, some solid substances as sulphur, phosphorus, wood and plastic, and some solutions as solution of hydrogen chloride in benzene and sugary solution.

7. Thermal conduction :

- **Good conductors of heat :**

  Ex.: Metals such as iron, copper, aluminium, ...

- **Bad conductors of heat :**

  Ex.: Wood and plastic.

B Chemical properties

Metals can be classified according to their chemical activity into three groups :

1 Very active metals

They are metals which react with oxygen when they are exposed to humid air, so they lose their metallic luster.

Examples :

- Sodium & potassium.

2 Less active metals

They are metals which react with oxygen if they are left in air for some days forming a layer of rust.

Examples :

- Iron, aluminium & copper.

3 Inactive metals

They are metals which find great difficulty in reacting with oxygen.

Examples :

- Silver, gold, platinum, nickel & chromium.

Questions  on lesson One



• Remember • Understand • Apply • Higher skills [ ] School book questions.

1. Choose the correct answer :

1. [ ] The colour property is a distinguishing factor between ....
   - a. table salt and flour.
   - b. iron and gold.
   - c. oxygen and nitrogen.
   - d. oxygen and carbon dioxide.

2. [ ] The taste property is a distinguishing factor between ....
   - a. milk and honey.
   - b. wood and plastic.
   - c. silver and gold.
   - d. oxygen and nitrogen.

3. [ ] The smell property is a distinguishing factor between ....
   - a. iron and copper.
   - b. vinegar and perfume.
   - c. wood and plastic.
   - d. silver and iron.

4. The density of a substance is a .... property.
   - a. chemical
   - b. physical
   - c. biological
   - d. magnetic

5. Density of matter = ...
   - a. $\frac{\text{Volume}}{\text{Mass}}$
   - b. $\frac{\text{Mass}}{\text{Volume}}$
   - c. Mass × Volume
   - d. Mass + Volume

6. Density of red copper is 8.8 gm/cm^3 means ....
   - a. the mass of the unit volume of red copper equals 8.8 gm.
   - b. the mass of the unit volume of red copper does not equal 8.8 gm.
   - c. the mass of 10 cm^3 of red copper equals 8.8 gm.
   - d. the mass of the unit volume of red copper equals 0.8 gm.

7. The volume of liquid is calculated from the relation ....
   - a. $\frac{\text{mass}}{\text{density}}$
   - b. $\frac{\text{density}}{\text{mass}}$
   - c. mass × density
   - d. density + mass

8. The mass of water in gm is always .... its volume in cm^3 (Knowing that the density of water is 1 gm/cm^3).
   - a. double
   - b. less than
   - c. more than
   - d. equal to

9. The following cubes have the same mass. Which one has the highest density ? ....
   - a.
   - b.
   - c.
   - d.

10. The density of a substance whose mass is 15 gm and occupies 30 cm^3 is ………… the density of water.
a. less than b. more than c. equal to d. double

11. Equal masses of different substances have ………… volumes.
a. similar b. different c. constant d. equal

12. In the opposite figure, if the volumes of the two balls (X) and (Y) are equal, so the mass of ball (X) is ………… the mass of ball (Y).
a. less than b. equal to
c. more than d. double

X
Y

13. ………… is from the substances that float on water surface.
a. Iron b. Copper c. Cork d. Aluminium

14. When a substance sinks in water, this means that its density is ………… the density of water.
a. equal to b. less than c. more than d. half

15. A piece of metal, whose mass is 25 gm and its volume is 10 cm^3. When it is placed in water it will ………… (Water density 1 gm/cm^3).
a. float. b. sink. c. suspend. d. dissolve.

16. The mass of a piece of rock whose density is 2.8 gm/cm^3 is 28 gm, so the density of 280 gm of it is ………… gm/cm^3.
a. 280 b. 28 c. 2.8 d. 28.5

17. The density of petroleum oil is ………… that of water.
a. less than b. more than c. equal to d. double

18. The balloons that are filled with helium gas in celebrations, rise up in air, because …………
a. density of helium is more than that of air.
b. density of helium equals that of air.
c. density of helium is less than that of air.
d. density of helium is double that of air.

19. ………… gas is used in filling balloons of celebrations.
a. Oxygen b. Nitrogen c. Neon d. Hydrogen

20. Heating coils are made up of ………… alloy.
a. iron-copper b. nickel-iron
c. nickel-chrome d. chrome-copper

21. Cooking pans are made up of ....

a. iron. b. aluminium. c. wood. d. plastic.

22. The solid substance whose melting point is 1500°C, starts to change into liquid at .... °C.

a. 1000 b. 1500 c. 1550 d. 2000

23. **In the following figures :**

Lamp, Electric battery, Aluminium slide (1)

Lamp, Electric battery, Plastic spoon (2)

Lamp, Electric battery, Red copper key (3)

Lamp, Electric battery, Air (4)

The lamp is illuminated in .... case(s) only.

a. (1) & (3) b. (2) c. (2) & (4) d. (4)

24. The property of electric conduction is a distinguishing factor between ....

a. iron and copper. b. wood and plastic.
c. iron and wood. d. iron and aluminium.

25. All of the following substances conduct electricity except ....

a. iron. b. aluminium. c. wood. d. copper.

26. Metals have all the following properties except they ....

a. are good conductors of electricity. b. are good conductors of heat.
c. have a high melting point. d. are bad conductors of electricity.

27. All of the following substances are good conductors of heat except ....

a. iron. b. copper. c. wood. d. aluminium.

28. All of the following solutions conduct electricity except .... solution.

a. salt b. acidic c. alkaline d. sugary

29. Among elements which have a great difficulty to react with oxygen of air is ....

a. potassium. b. sodium. c. aluminium. d. chromium.

30. The metal used to cover other substances which rapidly rust is ....

a. silver. b. copper. c. lead. d. iron.

. Choose from column (B) & (C) what suit them in column (A) :

(A)	(B)	(C)
Substance	**Importance**	**Scientific reason**
1. Helium 2. Aluminium 3. Platinum 4. Plastic	a. used in making jewels b. used in making handles of screwdrivers c. used in making heating coils d. used in filling balloons during festivals e. used in making cooking pans	A. as it is a bad conductor of electricity. B. as its density is less than the density of air. C. as its melting point is high. D. as it is chemically poor active. E. as it is a good conductor of electricity.

. Put (✓) in front of the right statement and (x) in front of the wrong one and correct it :

1. Taste property is used to differentiate between sugar and table salt. ( )
2. Smell property is a distinguishing factor between a perfume and ammonia. ( )
3. Density = Mass × Volume. ( )
4. The measuring unit of volume is cm^3. ( )
5. The measuring unit of density is cm^3/gm. ( )
6. Ice and cork float on water surface, while iron and glass sink in water. ( )
7. Wood floats on water surface as it has higher density than that of water. ( )
8. Equal masses of different substances have the same volumes. ( )
9. The density of hydrogen is higher than that of air. ( )
10. Melting point is the temperature at which the matter begins to change from a solid phase into a liquid one. ( )
11. Melting point and boiling point are from the physical properties of matter. ( )
12. Each substance has a definite melting point and a definite boiling point. ( )
13. Cooking pans are made up of aluminium as it has a low melting point. ( )
14. The melting point of wax is equal to the melting point of table salt. ( )
15. Heating coils are made up of nickel-chrome alloy. ( )
16. Cooking pans are made up of aluminium and stainless steel. ( )
17. Iron is soft, while rubber is hard at room temperature. ( )
18. Electric cables are made up of copper and aluminium. ( )
19. Wood and plastic are bad conductors of heat. ( )
20. When potassium is exposed to air, it rusts after several days. ( )
21. Iron rusts when it is exposed to dry air. ( )
22. Silver, platinum and gold are inactive metals. ( )

4. Write the scientific term of each of the following :

1. Anything that has a mass and a volume.
2. The mass of unit volume of the substance.
3. The amount of matter that the body contains.
4. The space occupied by a substance.
5. The measuring unit of density.
6. The temperature at which a substance begins to change from the solid state to the liquid state.
7. The temperature at which a substance begins to change from the liquid state to the gaseous state.
8. Metals react with atmospheric oxygen when they are exposed to humid air.
9. Metals react with atmospheric oxygen after a long time.
10. Metals which find a great difficulty to react with atmospheric oxygen when they are exposed to humid air.

5. Complete the following statements :

1. Matter is anything that has .... and ....
2. You can distinguish between gold and silver by their different ....
3. You can differentiate between table salt and sugar by their different ....
4. To determine the density of a body, you must know .... and ....
5. The measuring unit of mass is .... , while .... is the measuring unit of volume.
6. The density is the .... of unit volume of a substance and its measuring unit is ....
7. The mass of one cubic centimetre of matter is known as ....
8. A piece of lead of mass 114 gm occupies 10 cm^3, its density is ....
9. .... and .... can sink in water as they have .... density than that of water.
10. The melting point is the temperature at which matter begins to change from a .... state into a .... state.
11. .... is the temperature at which the liquid begins to change into gas.
12. .... and .... are from the substances which have low melting points, while .... and .... are from the substances which have high melting points.
13. An alloy of .... is used in making jewels, while an alloy of .... is used in making heating coils.
14. .... is one of the solid substances which appear soft at room temperature, while .... and .... don't become soft by heating.
15. .... and .... are good conductors of electricity and heat, while .... and .... are bad conductors of electricity and heat.

- 16. Some solutions are good conductors of electricity as .... and .... , while others are bad conductors of electricity as ....
- 17. Electric wires are made up of .... or .... as they are .... conductors of electricity.
- 18. Electric screwdrivers are made up of .... , while their handles are made up of .... or ....
- 19. .... , aluminium and .... are from elements that react with atmospheric oxygen after a long time.
- 20. Active metals lose their .... when they are exposed to .... air.
- 21. .... and .... are very active metals, while .... and .... are inactive metals.
- 22. Light posts in streets are painted from time to time to be protected from ....

6. Give reasons for the following :

1. Air is considered as matter.
2. Colour, taste and odour can't be used to differentiate between water and oxygen gas.
3. The mass of 1 cm^3 of iron is higher than that of 1 cm^3 of wood.
4. • Equal volumes of different substances have different masses.
   • Equal masses of different substances have different volumes.
5. A piece of wood floats on water surface, while a piece of lead sinks in it.
6. An iron nail sinks in water, while one kilogram of cork floats on its surface.
7. Ice floats on water, although they are different states of the same matter.
8. Water isn't used to put off petrol fires.
9. Balloons filled with hydrogen or helium rise up in the air carrying flags during festivals.
10. A piece of ice changes into water after a period of time when it is left in air.
11. Workmen melt the solid metals.
12. It's easy to shape metals, while it's difficult to shape coal.
13. Iron rods not copper rods are used in building concrete houses.
14. Electric wires (or cables) are made up of copper or aluminium and they are covered by a plastic layer.
15. An electrician uses a screwdriver made up of steel iron with a plastic handle.
16. Cooking pans are made up of aluminium or stainless steel alloy which doesn't rust.
17. Handles of cooking pans are made up of wood or plastic.
18. Active metals such as sodium lose their metallic luster when they are exposed to moist air.
19. Potassium and sodium are kept under kerosene surface.

20. • Steel bridges and holders of light bulbs are painted from time to time.
    • Metallic spare parts of cars are covered with grease.
    • Some metallic pitchers are covered with a layer of silver.

21. Cooking pans made up of aluminium are washed with a rough material.

22. Gold, silver and platinum are used in making jewels.

7. Mention an example of each of the following :

1. A gas, whose density is lower than that of air.
2. A substance that has a low melting point.
3. A substance that has a high melting point.
4. An alloy that is used in making jewels.
5. An alloy that is used in making heating coils.
6. An alloy that is used in making cooking pans.
7. A solid substance which is soft at room temperature.
8. A solid substance which doesn't become soft by heating.
9. A substance, whose solution in benzene doesn't conduct electricity.
10. A substance that doesn't conduct electricity.
11. A good conductor matter for heat and electricity.
12. A substance which doesn't conduct electricity and heat.
13. A very active metal.
14. A metal reacts with oxygen as soon as being exposed to humid air.
15. A substance that is used to plate other metals.
16. A substance that is used to cover metallic spare parts of cars.

8. What is meant by ... ?

1. Matter.
2. Volume.
3. Mass.
4. The mass of an object equals 4 gm.
5. The mass of 1 cm^3 of aluminium is 2.7 gm.
6. The mass of unit volume of water 1 gm.
7. Density.
8. The density of iron is 7.8 gm/cm^3.
9. The density of water is 1 gm/cm^3.
10. The density of aluminium equals 2.7 gm/cm^3.
11. Melting point.
12. The melting point of ice = $0^{\circ}C$.
13. Boiling point.
14. The boiling point of water = $100^{\circ}C$.

9. Mention one life application of each of the following :

1. Density.
2. Melting point.
3. Boiling point.
4. Hardness.
5. Electric conduction of matter.
6. Thermal conduction of matter.
7. Chemical activity.

10. Mention one importance (use) of each of the following :

1. Helium gas.
2. Copper-gold alloy.
3. Stainless steel alloy.
4. Nickel-chrome alloy.
5. Copper.
6. Wood and plastic.
7. Nickel.

11. What happens when ... ?

1. • Increasing the mass of a body to double "according to its density".
   • Decreasing the volume of a body to half "according to its density".
2. Putting a piece of cork and a metallic coin in water.
3. Using water to extinguish petrol fires.
4. Heating a piece of coal.
5. An iron nail moisten by water is exposed to air for several days and why ?
6. Leaving steel bridges and the holders of light bulbs without paint.
7. Leaving some metals exposed to air for a long time and why ?

12. Choose the odd word out, then write the scientific term of the others :

1. Density – Mass – Force – Volume.
2. Petroleum – Wood – Cork – Iron.
3. Wax – Aluminium – Butter – Ice.
4. Iron – Copper – Aluminium – Wood.
5. Silver – Chromium – Potassium – Platinum.
6. Sulphur – Phosphorus – Plastic – Aluminium – Wood.
7. Acidic solutions – Sugary solutions – Salt solutions – Alkaline solutions.

13. Compare between :

1. Sugary and alkaline solutions **"concerning : electric conduction"**.
2. Iron and sulphur **"concerning : hardness – electric conduction"**.

3. Copper and plastic "**concerning : electric conduction – thermal conduction**".
4. Sodium and nickel "**concerning : chemical activity**".
5. Very active metals, less active metals and inactive metals "**concerning : reaction with oxygen – examples**".

14. Problems :

1. Calculate the density of iron cube, whose mass 70.2 gm and its volume 9 cm^3.
2. The density of copper is 8.8 gm/cm^3. Find the volume of 0.5 kg of copper.
3. If the density of alcohol is 0.8 gm/cm^3. Find the volume of 80 gm of it.
4. Calculate the mass of a piece of sulphur, whose volume is 5 cm^3, knowing that the density of sulphur is 2.1 gm/cm^3.
5. When a piece of iron of mass 78 gm is put in a graduated cylinder containing 100 cm^3 of water, the reading of the cylinder becomes 110 cm^3.
   Calculate the density of iron.
6. In an experiment for determining the density of water, the following results are recorded
   - The mass of an empty cylinder = 65 gm.
   - The mass of the cylinder and water = 165 gm.
   - The volume of water = 100 cm^3.

   Calculate the density of water.
7. In an experiment to determine the density of a kind of rocks, the following results are recorded :
   - The volume of water in the cylinder = 80 cm^3.
   - The volume of water and the piece of rock = 100 cm^3.
   - The mass of the piece of rock = 50 gm.

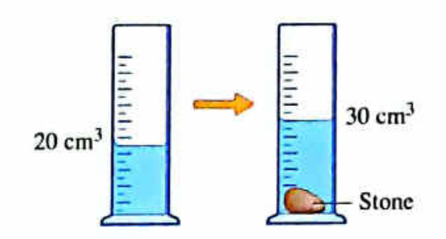
   Calculate the density of the rock.
8. A piece of marble, whose mass is 100 gm is immersed in a measuring cylinder containing water, then water raised from 40 cm^3 to 60 cm^3. What's the density of marble ?
9. When a piece of aluminium, whose mass is 27 gm is immersed in a graduated cylinder containing 100 cm^3 of water, the water level rises. **Calculate** the reading of water level after immersed this piece.
   [knowing that the density of aluminium is 2.7 gm/cm^3].
10. Two balls of the same metal , the volume of the first is 10 cm^3 and that of the second is 20 cm^3 , if the mass of the first ball is 78 gm. **Calculate the mass of the second ball.**

11. **From the opposite figure :**

a. Calculate the volume of the stone.

b. If the mass of the stone = 80 gm.
What's the density of this stone ?

c. If this stone is placed in a jar containing mercury.
Does it sink or float ? Give a reason.
[knowing that the density of mercury is 13.6 gm/cm^3].



15. Variant questions :

- **(1) Mention the formula by which you can calculate the density.**
- **(2) Complete the following table, then answer the given questions :**

Body	Mass	Volume	Density
A	16 gm	2 cm^3	.......(1).......
B	8 gm	4 cm^3	.......(2).......
C	4 gm	8 cm^3	.......(3).......
D	8 gm	16 cm^3	.......(4).......

1. Which one of these bodies has the highest density ?
2. Which one of these bodies has the lowest density ?

- **(3) One of your classmates has bought a medal of silver, he thought it was fake. How can you help him to verify this thought ?**
- **(4) Which of the following bodies float or sink in water ? Why ?**


Iron


Wood


Glass


Ice

- **(5) If you know that the density of natural milk is 1.03 gm/cm^3, how do you recognize the quality of milk you have bought ?**
- **(6) Classify the following substances according to the chemical activity.**
  [Chromium – Sodium – Nickel – Iron – Aluminium – Gold – Platinum – Potassium – Copper].

(7) In the following two figures after the key is closed. In which figure does the lamp illuminate ? Why ?

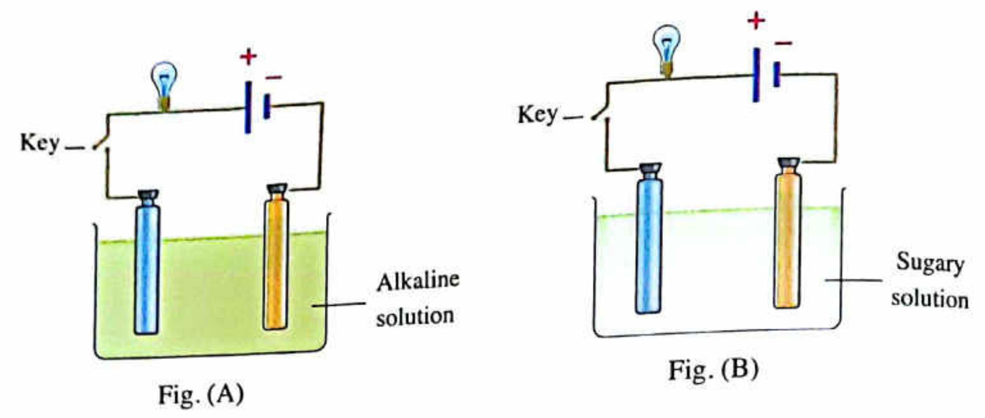


Fig. (A) Fig. (B)

(8) A student put some eggs in a pot filled with water and noticed that some of them floated. He deduced from the values shown in the following table that ....

a. rotten eggs float on water surface.

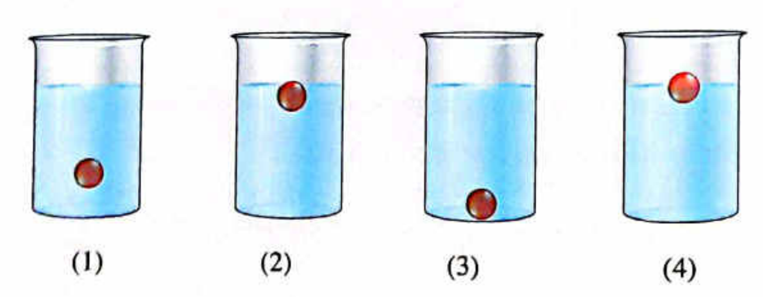
b. fresh eggs float on water surface.

c. rotten eggs sink in water.

d. fresh eggs suspend in water.

Substance	Density (gm/cm^3)
Water	1
Rotten egg	0.9
Fresh egg	1.2

(9) In the following figures :

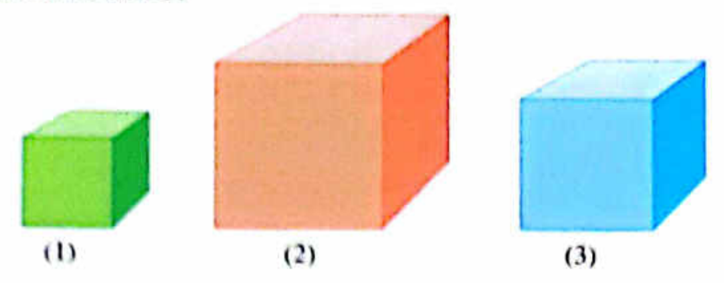


(1) (2) (3) (4)

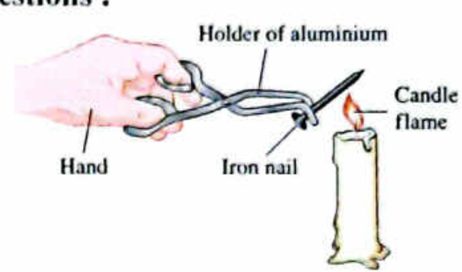
a. If the balls are similar in their volumes and their masses, also the liquids are different in their densities. Arrange the liquids in an ascending order according to their densities.

b. If the balls are from different materials, which are different in their densities, while the liquids are similar in their densities. Arrange the balls in an ascending order according to their densities.

(10) Arrange the following cubes ascendingly according to the density. Knowing that they have the same mass.

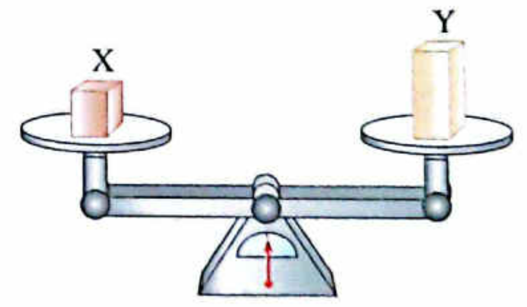


(11) From the opposite figure, answer the following questions :



1. Mention why the hand feels the heat of the flame.
2. What happens when the iron nail is replaced by a piece of wax ? Why ?

(12) From the opposite figure, the two objects (X) and (Y) that have the same .... and ....



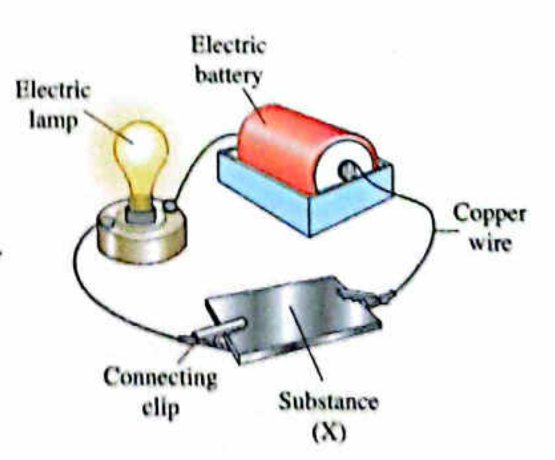
a. volume – density.

b. mass – density.

c. mass – made up of two different materials.

d. volume – made up of the same material.

(13) From the opposite figure, answer the following questions :



1. What do you conclude from the illumination of the electric lamp ?
2. What happens for the illumination of the lamp in the following cases. Explain why ?
   a. Connect the connecting clips to the ends of a piece of wood instead of substance (X).
   b. Immerse the connecting clips in dil. hydrochloric acid solution.



Thinking Skills Questions

1. Choose the correct answer :

1. The density of 12 gm of pure iron is ………… the density of 2 gm from it.

   a. more than b. less than c. equal to d. double

2. The mass of a piece of ice before melting is ………… its mass after melting.

   a. more than b. less than c. equal to d. double

3. Two objects (A) & (B) are equal in mass, if the density of the substance of object (A) is double the density of the substance of object (B), so the ratio between the volume of object (A) to the volume of object (B) is …………

   a. 1 : 1 b. 1 : 2 c. 2 : 1 d. 3 : 1

2. Look at the following figures, then answer :

- Figure (1) shows a plastic jar contains a metallic ball and a hollow glass ball, their mass becomes M_1
- Figure (2) shows the same plastic jar after shaking it gently for a short time, so their mass becomes M_2
- Figure (3) shows the same plastic jar after shaking it hard for a longer time, so total mass becomes M_3

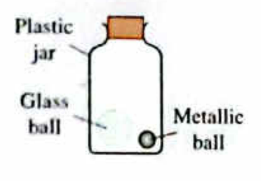


Figure (1)

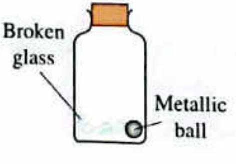


Figure (2)

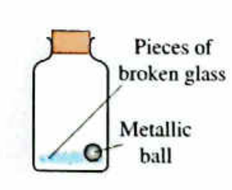


Figure (3)

Which of the following choices represents the relation between the three masses ? …………

a. $M_1 = M_2 = M_3$ b. $M_1 > M_2 > M_3$

c. $M_1 < M_2 > M_3$ d. $M_1 < M_2 < M_3$

3. Problems :

1. A cube of wood, whose length of side is 2 cm and its mass is 6 gm.

   a. Calculate its density.

   b. Does this cube sink in water or float on its surface ? [Give a reason]
   [Knowing that the density of water is 1 gm/cm^3].

2. If the density of the Earth's surface is 3 gm/cm^3, and the density of Moon's surface is 2.5 gm/cm^3. **Compare between the mass of 10 cm^3 of the Earth's surface and the same volume of Moon's surface.**

3. A balloon of rubber, whose mass is 0.5 gm, it has been filled with 1000 cm^3 of helium gas, if the density of helium is 0.00017 gm/cm^3.

   Calculate the mass of the balloon that is full of helium gas.

4. Three metallic elements (X , Y , Z) react with oxygen by varying degrees as follows :

- (X) finds great difficulty in reacting with oxygen.
- (Y) reacts instantly.
- (Z) reacts after few days.

Answer the following questions :

(1) Arrange the previous metallic elements descendingly according to the degree of chemical activity.

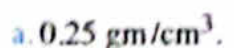
(2) Mention two examples of element (Y).

(3) Which of the previous metals can be used in :

a. Making cooking pans ?

b. Making jewels?

5. When we put 30 cm^3 of water in a graduated cylinder [as in fig. (1)], then 10 identical balls of glass are placed into it [as in fig. (2)]. If the mass of one ball is 10 gm. What is the density of the glass material from which the balls are made ? ....


a. 0.25 gm/cm^3.

b. 0.4 gm/cm^3.

c. 2.5 gm/cm^3.

d. 4 gm/cm^3.

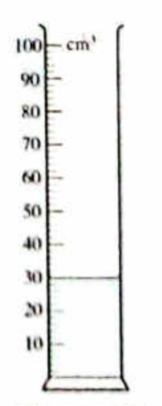


Figure (1)

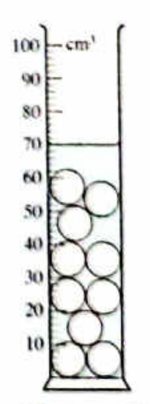
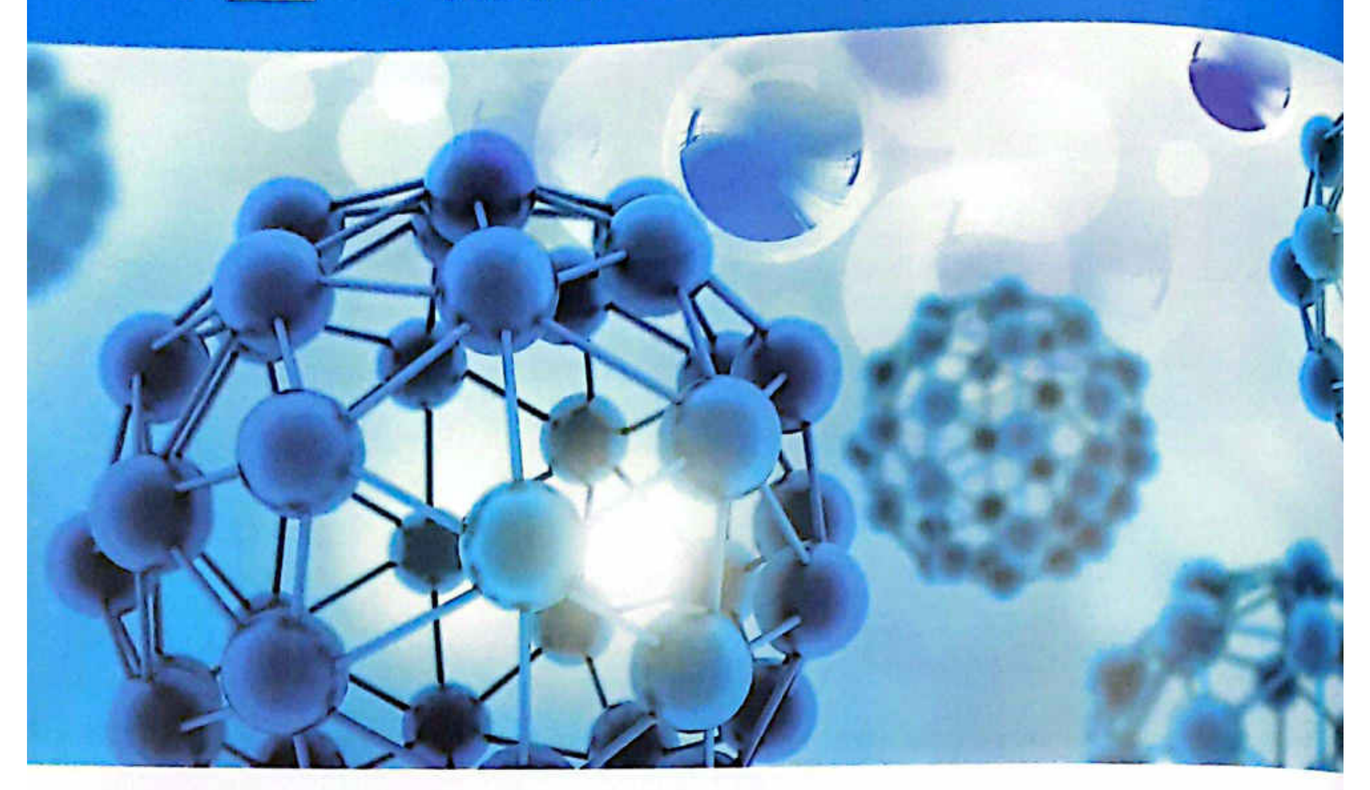


Figure (2)

LESSON 2

Matter Construction



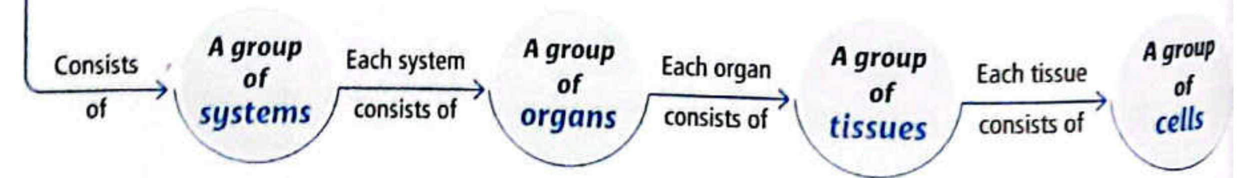
What is the smallest part of matter that can exist freely ?

You have known from the previous studies that the building unit of the body of a living organism is **the cell**.





The body of a living organism



Similarly, the molecule is the building unit of matter.

The molecule

It is the smallest part of matter which can exist freely and it has the properties of matter.

Activity 1 • To show that matter is composed of molecules :



Steps:

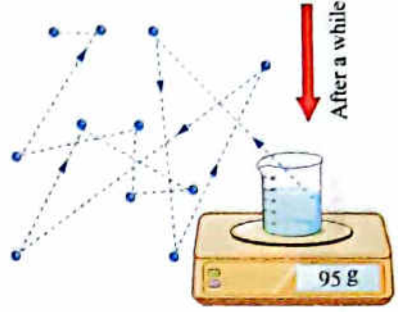
1. Put a suitable amount of perfume in a glass beaker, then determine its mass by using a digital balance.
2. Leave the beaker in one side of the room for a period of time, then move to the other side of the room.
3. Determine the mass of the beaker again.



The mass of the beaker of perfume at the beginning of the activity

Observations:

- The odour of the perfume spreads all over the room.
- The mass of the beaker decreases.



The mass of the beaker after spreading of perfume particles

Explanation:

- The matter of the perfume is divided into tiny (small) particles which can't be seen by the naked eye or by a microscope.
- The particles of the perfume are called **"molecules"** that spread all over the room keeping the properties of the perfume.



Conclusion:

Matter in any state (solid, liquid or gaseous) is composed of small building units called **"Molecules"**.

Question



Complete :

1. .... is the building unit of matter, while .... is the building unit of the body of a living organism.
2. The properties of .... of perfume are the same properties of 100 gm from it.

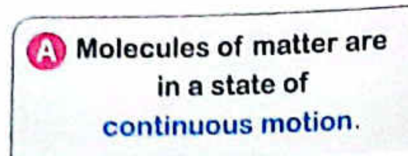
Now, we will study :



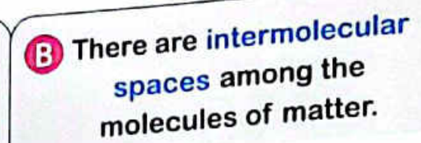
First	Second	Third
The properties of the molecules of matter.	The relation between the temperature of matter and its physical state.	Matter and molecules.

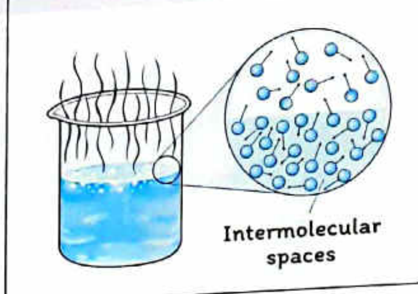
FIRST The properties of the molecules of matter

The properties of the molecules of matter are :

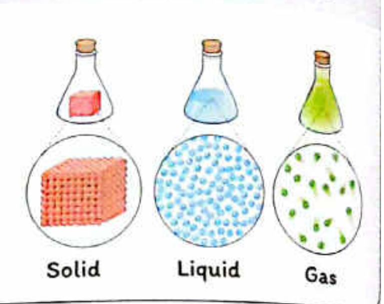


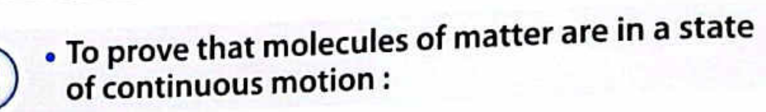






Ⓒ There are attraction forces among the molecules of matter.





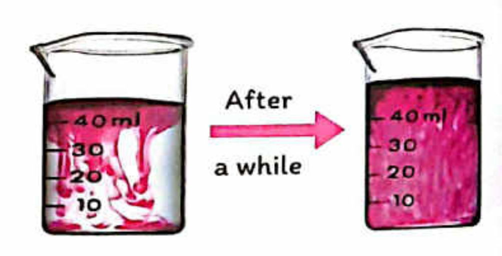
Activity 2 • To prove that molecules of matter are in a state of continuous motion :





Step:

Put a small quantity of potassium permanganate in a glass beaker containing water, then leave it for a while.





Observation:

The violet colour of permanganate spreads (diffuses) gradually through the water.

Explanation:

Permanganate is dissociated into particles that spread through the water in all directions until the colour of water changes into violet.

Conclusion:

The molecules of matter are in a state of continuous motion.

G.R.

- ***A drop of ink spreads through water.***
  Because the molecules of ink are in a continuous motion in all directions among water molecules.

- ***When you leave the perfume bottle open, you smell it all over the room.***
  Because the molecules of the perfume are in a continuous motion and they keep the properties of perfume.



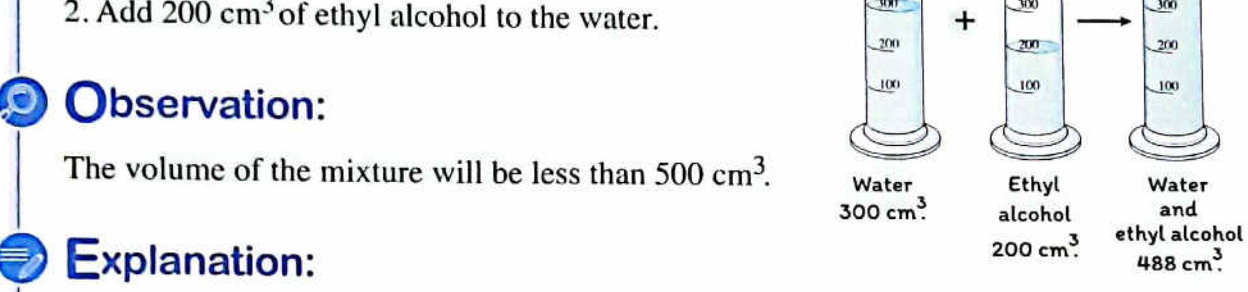
The molecules of solid matter have a limited vibrational motion, while the motion of liquids is more free and that of gases is completely free.

Activity (3)

• To prove the presence of intermolecular spaces among the molecules of matter :

Steps:

1. Put 300 cm^3 of water in a graduated cylinder.
2. Add 200 cm^3 of ethyl alcohol to the water.



Observation:

The volume of the mixture will be less than 500 cm^3.

Explanation:

Some of ethyl alcohol molecules are distributed in the intermolecular spaces that are found among water molecules.

Conclusion:

There are intermolecular spaces among the molecules of matter.

Intermolecular spaces

The spaces that are found among the molecules of matter.

G.R.

- ***The volume of a mixture of water and alcohol is less than the sum of their volumes before mixing.***

  Because some molecules of alcohol occupy the intermolecular spaces among water molecules.

- ***Disappearance of a little amount of table salt when it is put in a beaker containing water for a period of time.***

  Because when the table salt dissolves in water, the molecules of table salt spread in the intermolecular spaces among water molecules.



• To prove the presence of intermolecular forces (attraction forces) among the molecules of matter :

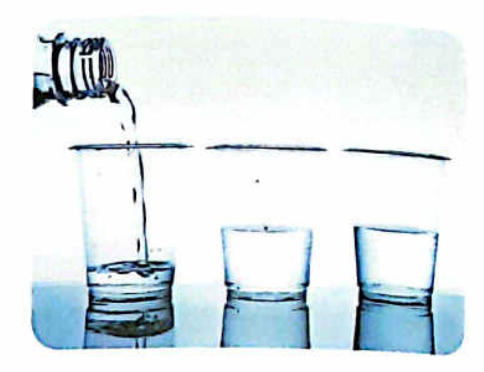


Steps:

1. Try to break an iron piece with your fingers or by hammering it.



2. Try to divide an amount of water in small cups.



Observations:

• **It is difficult to break a piece of iron. G.R.**

Because the attraction force among molecules is very strong in solids (such as iron and aluminium).

• **It is easy to divide an amount of water. G.R.**

Because the attraction force among molecules is weak in liquids (such as water, alcohol and oil).

Conclusion:

There are intermolecular forces (attraction forces) among the molecules of matter.

Intermolecular force

The force that binds the molecules of matter together.



The intermolecular forces among the molecules of gases are almost not existed.

Question

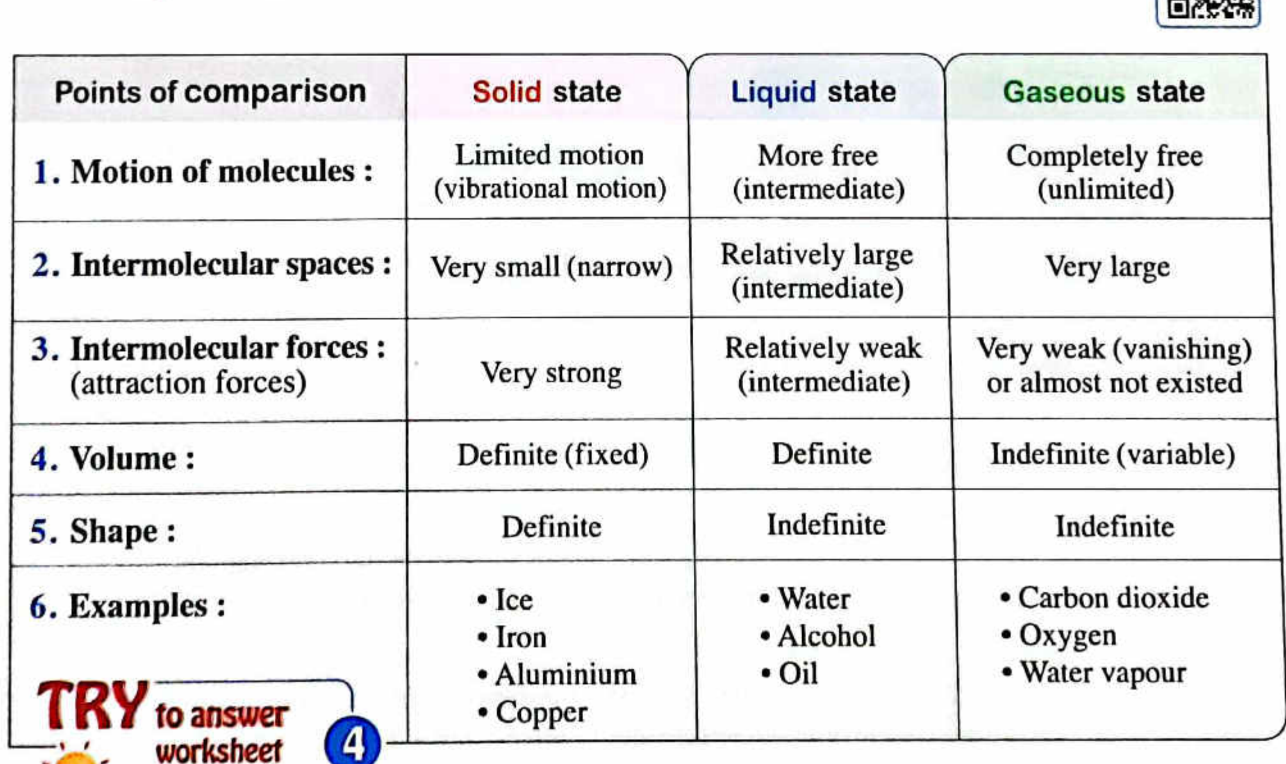
Complete :

1. The attraction force between water molecules is .... that between water vapour molecules.
2. The attraction force between iron molecules is ....

➲ From the previous activities, **we can conclude that :**

Solids	Liquids	Gases
They have definite shapes and volumes. **G.R.**	They have definite volumes and indefinite shapes. **G.R.**	They have indefinite shapes and volumes. **G.R.**
Because they are characterized by :		
• Narrow (tiny) intermolecular spaces. • Very strong intermolecular forces.	• Intermediate (relatively large) intermolecular spaces. • Weak intermolecular forces.	• Very large intermolecular spaces. • Very weak intermolecular forces.
So, the molecules are relatively fixed in their positions.	***So,*** they take the shape of the container in which they are put.	***So,*** the molecules are completely free.
Molecules of solid matter	Molecules of liquid matter	Molecules of gaseous matter

➲ **Comparison between** the three states of matter (solid, liquid and gaseous) :



Points of comparison	Solid state	Liquid state	Gaseous state
1. Motion of molecules :	Limited motion (vibrational motion)	More free (intermediate)	Completely free (unlimited)
2. Intermolecular spaces :	Very small (narrow)	Relatively large (intermediate)	Very large
3. Intermolecular forces : (attraction forces)	Very strong	Relatively weak (intermediate)	Very weak (vanishing) or almost not existed
4. Volume :	Definite (fixed)	Definite	Indefinite (variable)
5. Shape :	Definite	Indefinite	Indefinite
6. Examples :	• Ice • Iron • Aluminium • Copper	• Water • Alcohol • Oil	• Carbon dioxide • Oxygen • Water vapour

SECOND The relation between the temperature of matter and its physical state

On heating the solid substance

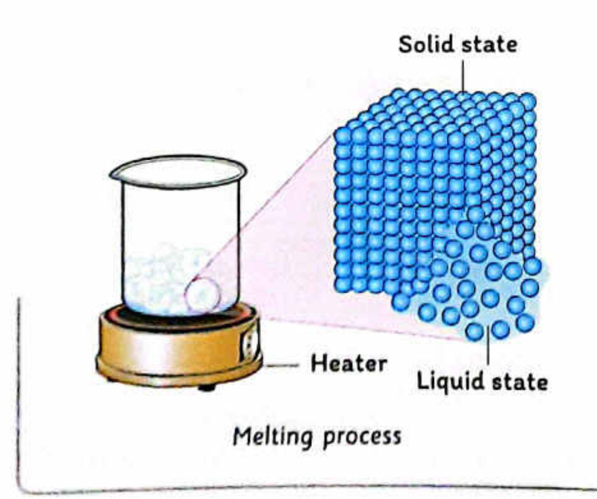
Its molecules gain thermal energy.

So, the speed of its molecules increases and at the melting point, the intermolecular force weaken.

So, the intermolecular spaces increase and they become more freely leading to the change of matter from the solid state into the liquid state, this process is known as Melting.

Melting process

It is the change of matter from the solid state to the liquid state by heating.



Melting process

On heating the liquid substance

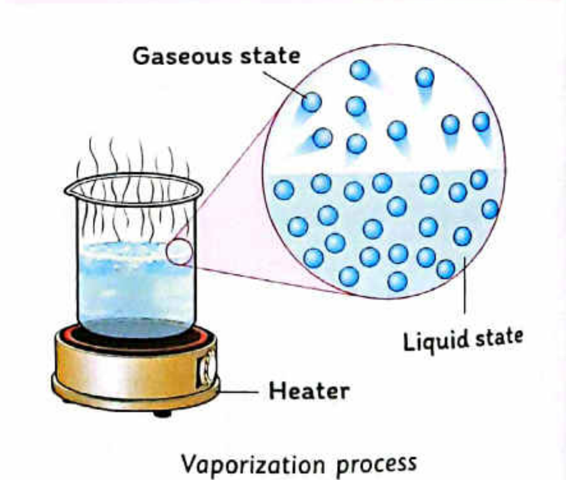
Its molecules gain thermal energy.

So, the speed of its molecules increases and at the boiling point, the molecules overcome the intermolecular forces (become more free).

So, the intermolecular spaces increase and they escape in the form of vapour, this process is known as Vaporization.

Vaporization process

It is the change of matter from the liquid state to the gaseous state by heating.



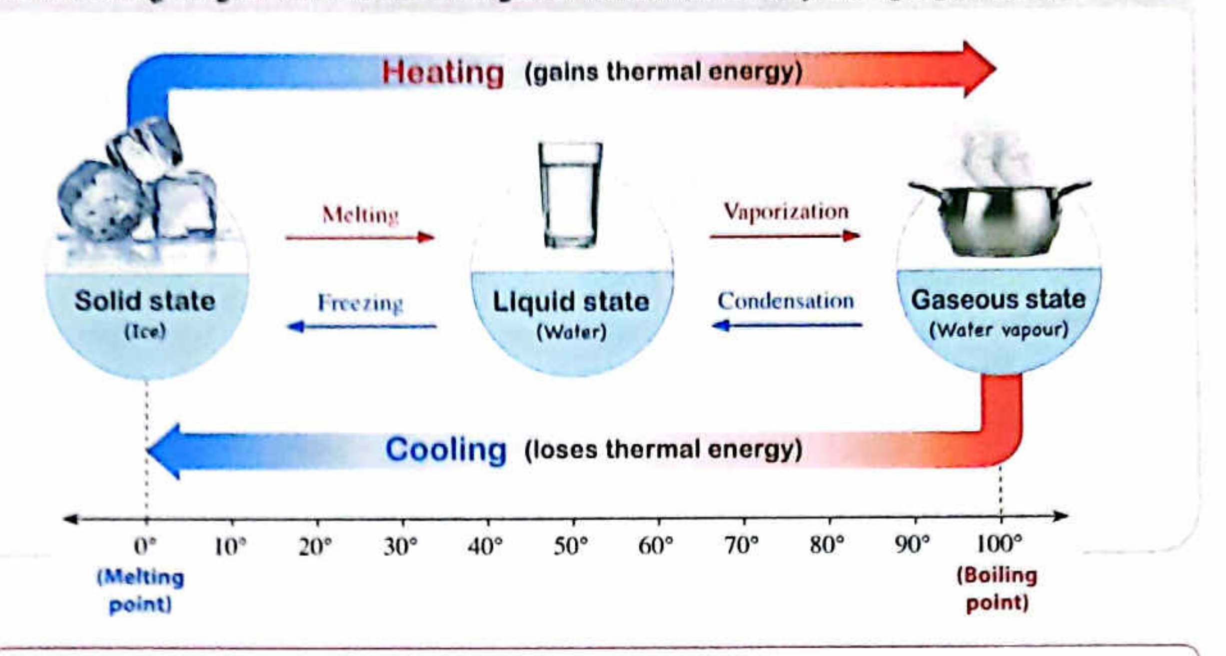
Vaporization process

▸ Enrichment information

1. ***The latent heat of melting :***
   It is the amount of heat required to change 1 kg of a substance from the solid state to the liquid state without change in the temperature (although heating is continued).

2. ***The latent heat of vaporization :***
   It is the amount of heat required to change 1 kg of a substance from the liquid state to the gaseous state without change in the temperature (although heating is continued).

- **The following diagram shows the changes of matter (water) by changing its temperature :**



NB The **melting** process reverses the **freezing** process, while the **vaporization** process reverses the **condensation** process.

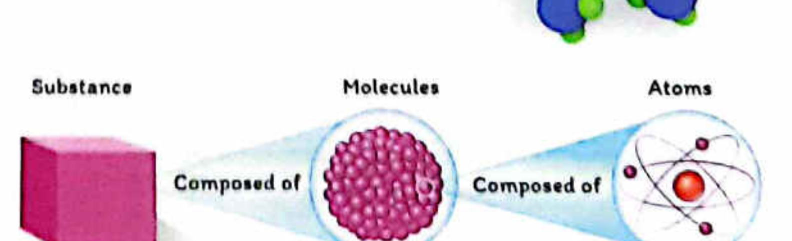
Question

Complete :

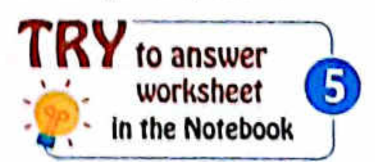
1. The melting process reverses the .... process.
2. On heating a liquid substance, a .... process takes place.

THIRD Matter and molecules

- A drop of water is composed of millions of very tiny water molecules which can't be seen by the naked eye or by the microscope.
- The molecules of one substance are **alike** in properties, but they **differ** from those of other substances.
- The molecules are composed of tiny structural units called "Atoms".



Molecules of any substance are composed of atoms





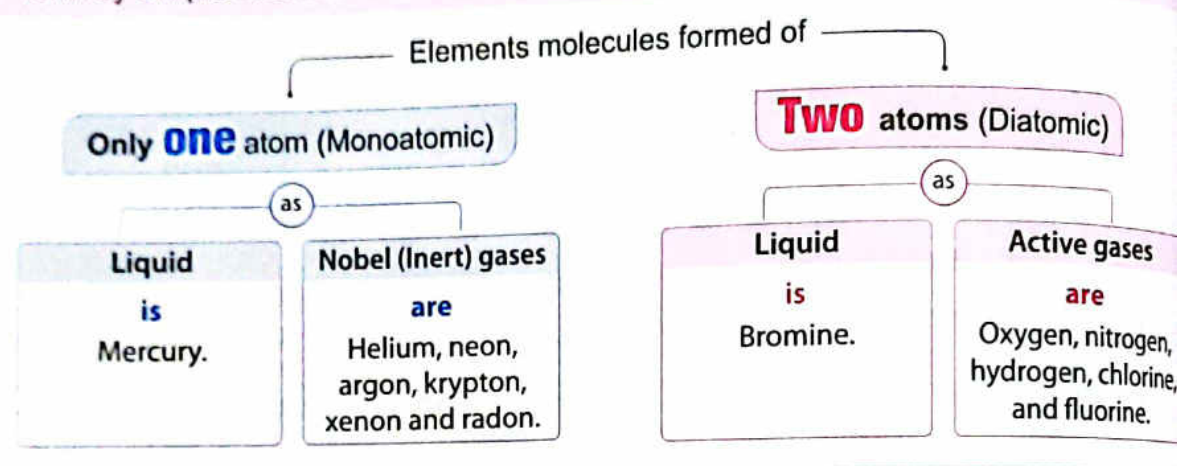


1 The element molecule

The element molecule is formed of similar atoms (one or more atoms) that combine togeth

The element

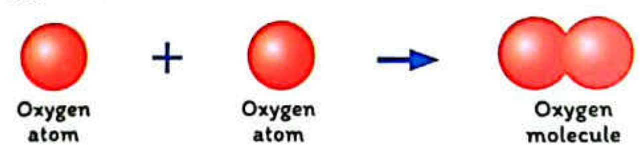
It is the simplest pure form of matter which can't be analyzed chemically into simpler form by simple chemical methods.



NB

1. The molecules of active gases are diatomic, while molecules of nobel gases are monoatomic.

   Example : Oxygen molecule as an active gas.



2. Mercury is the liquid element which is composed of one atom, while bromine is the liquid element which is composed of two atoms.

2 The compound molecule

The compound molecule is formed of different atoms that combine together.

The compound

It is a substance which is formed from the combination of atoms of two or more different elements with constant weight ratios.

Examples of some known compounds :

Compound molecule	The type and the number of atoms
1. Hydrogen chloride molecule :	It consists of **two atoms** of **two different elements**. Hydrogen atom + Chlorine atom → Hydrogen chloride molecule
2. Water molecule :	It consists of **three atoms** of **two different elements**. Two hydrogen atoms + One oxygen atom → Water molecule
3. Ammonia molecule :	It consists of **four atoms** of **two different elements**. Three hydrogen atoms + One nitrogen atom → Ammonia molecule

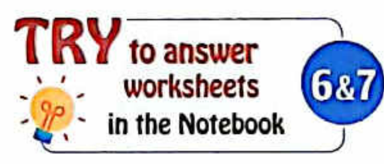
G.R. ***The properties of molecules of substances are different from each other.***

Because molecules of various substances differ from each other in :

a. number of atoms.

b. kind of atoms.

c. way of combination between atoms.



Comparison between element and compound :

Points of comparison	Element	Compound
1. Definition :	It is the simplest pure form of matter which can't be analyzed chemically into simpler form by simple chemical methods.	It is a substance which is formed from the combination of atoms of two or more different elements with constant weight ratios.
2. Atoms :	Similar.	Different.
3. Examples :	Hydrogen, oxygen, aluminium and sulphur.	Water, hydrogen chloride, carbon dioxide and ammonia.

Remember Lesson Two



The molecule :

- It is the smallest part of matter which can exist freely and it has the properties of matter.
- It is the building unit of matter.

Properties of molecules :

- Molecules of matter are in a continuous motion.
- There are intermolecular spaces among the molecules of matter.
- There are intermolecular forces among the molecules of matter.

Intermolecular spaces :

The spaces that are found among the molecules of matter.

Intermolecular force : The force that binds the molecules of matter together.

The motion of molecules of :	The intermolecular spaces among the molecules of :	The intermolecular forces among the molecules of :
• **Solid matter** is limited. • **Liquid matter** is intermediate. • **Gaseous matter** is completely free.	• **Solids** are narrow. • **Liquids** are relatively large. • **Gases** are very large.	• **Solids** are very strong. • **Liquids** are weak. • **Gases** are almost not existed.

Melting process :

It is the change of matter from the solid state to the liquid state by heating.

Vaporization process :

It is the change of matter from the liquid state to the gaseous state by heating.

The element :

It is the simplest pure form of matter which can't be analyzed chemically into simpler form by simple chemical methods.

The compound :

It is a substance which is formed from the combination of atoms of two or more different elements with constant weight ratios.

Questions  on lesson Two


Interactive Exercises

● Remember ● Understand ● Apply ● Higher skills 📖 School book questions.

1. Choose the correct answer :

1. The properties of .... of water is the same properties of 100 ml of it.
   a. an atom b. a molecule c. an ion d. an element

2. The motion of solid molecules is ....
   a. limited. b. unlimited. c. completely free. d. the most.

3. On adding 30 cm^3 of water to 20 cm^3 of alcohol, the volume of the mixture may become .... cm^3.
   a. 30 b. 48.8 c. 50 d. 54

4. The intermolecular spaces among the molecules of .... are very small.
   a. iron b. mercury c. nitrogen d. water

5. The liquid matter is characterized by all of the following except ....
   a. the intermolecular distances among its molecules are intermediate.
   b. it takes the shape of the container.
   c. the intermolecular force among its molecules is very weak.
   d. the motion of its molecules is more free.

6. The intermolecular spaces among the molecules of oxygen gas is ....
   a. medium. b. very large. c. very small. d. absent.

7. The attraction force among solid molecules is ....
   a. very strong. b. weak. c. very weak. d. absent.

8. The attraction force between water molecules is .... that between water vapour molecules.
   a. more than b. less than c. equal to d. half to

9. .... don't take the shape of their containers.
   a. Solids and liquids b. Liquids only
   c. Gases and liquids d. Solids only

10. On heating a solid substance, ...
   a. the speed of its molecules increases.
   b. the speed of its molecules decreases.
   c. the intermolecular spaces among its molecules decrease.
   d. the attraction force among its molecules increases.

11. On heating a liquid substance, ...
a. the speed of its molecules decreases.
b. the intermolecular spaces among its molecules increase.
c. the attraction force among its molecules increases.
d. the intermolecular spaces among its molecules decrease.

12. The melting process reverses the .... process.
a. freezing b. vaporization c. condensation d. boiling

13. The molecule is composed of very small particles called ....
a. atoms. b. elements. c. compounds. d. cells.

14. The molecule that consists of similar atoms is called ....
a. an atom. b. an element molecule.
c. a compound molecule. d. a mixture.

15. Molecules of nobel gases are composed of .... atom(s).
a. one b. two c. three d. four

16. From inert gases is ....
a. nitrogen. b. helium. c. oxygen. d. hydrogen.

17. .... is the monoatomic liquid molecule.
a. Bromine b. Iodine c. Mercury d. Chlorine

18. The intermolecular force among the molecules of mercury is ....
a. large. b. weak. c. vanished. d. very weak.

19. All of the following are diatomic gaseous molecules except ....
a. hydrogen. b. nitrogen. c. argon. d. chlorine.

20. The molecule that consists of different atoms is called ....
a. an atom. b. an element molecule.
c. a compound molecule. d. an inert gas.

21. Water molecule is composed of ....
a. one hydrogen atom and two oxygen atoms.
b. one hydrogen atom and two nitrogen atoms.
c. one oxygen atom and two hydrogen atoms.
d. two hydrogen atoms and two oxygen atoms.

22. All of the following are molecules of elements except ....
a. b. c. d.

23. The molecule of oxygen is composed of .... atom(s).
a. one b. two c. three d. four

24. .... molecule is composed of two atoms of two different elements.
   a. Chlorine b. Water c. Hydrogen chloride d. Ammonia

25. The model that represents water molecule is ....
   a. b. c. d.

26. The number of elements is equal to the number of atoms in .... molecule.
   a. water b. ammonia c. hydrogen chloride d. oxygen

27. Which one of the following molecules contains the largest number of atoms ? ....
   a. Hydrogen chloride. b. Bromine. c. Ammonia. d. Water.

28. Ammonia and water molecules participate in the presence of .... atoms.
   a. nitrogen b. hydrogen c. oxygen d. chlorine

29. One gram of .... contains one type of atoms.
   a. iron b. ammonia c. hydrogen chloride d. water

2. Put (✓) in front of the right statement and (x) in front of the wrong one and correct it :

1. The molecule is the smallest part of matter which can exist in a free state and keep the properties of matter. ( )
2. The molecules of solid substances vibrate in a simple vibratory motion. ( )
3. The motion of gaseous molecules is limited. ( )
4. When 100 cm^3 of water is added to 100 cm^3 of ethyl alcohol, the volume of the mixture is greater than 200 cm^3. ( )
5. The distances among solid molecules are very small. ( )
6. The attraction forces among molecules of solids are very small. ( )
7. Liquids have definite shapes and volumes. ( )
8. Gaseous matter keeps its shape and volume whatever the container changes. ( )
9. During melting process, the solid molecules lose energy. ( )
10. The speed of water vapour molecules is greater than that of water molecules. ( )
11. The molecules of the same substance are different from each other. ( )
12. Atoms of the same element are different. ( )
13. Molecules consist of atoms. ( )
14. The molecules of active gases are formed of one atom, while the molecules of inert gases are formed of two atoms. ( )
15. Element is the simplest pure form of matter. ( )
16. Oxygen element is a gaseous diatomic molecule. ( )
17. Mercury is from solid metals. ( )
18. The compound consists of a combination of atoms of one element. ( )
19. Water molecule is composed of two atoms of three elements. ( )
20. Ammonia molecule consists of one oxygen atom and three hydrogen atoms. ( )

3. Write the scientific term of each of the following :

1. • The building unit of matter.
   • The smallest part of matter that can exist freely state and matter properties appea
2. The spaces that are found among the molecules.
3. The force that binds the molecules of matter together.
4. The change of matter from the solid state to the liquid state by heating.
5. The change of matter from the liquid state to the gaseous state by heating.
6. The building unit of a molecule.
7. • The simplest form of matter which can't be decomposed into a simpler one.
   • The simplest pure form of matter which can't be analyzed into simpler form.
8. The gases in which the molecule consists of one atom.
9. The gases in which the molecule consists of two atoms.
10. The monoatomic liquid element.
11. The diatomic liquid element.
12. The product results from combination of atoms of different elements with consta weight ratios.
13. The compound molecule which is formed of two hydrogen atoms and one oxygen ato
14. The compound molecule which is formed of one hydrogen atom and one chlorine ato
15. The compound molecule which is formed of three hydrogen atoms and one nitrogen at

4. Complete the following statements :

1. .... is the building unit of matter, while .... is the building unit of the body of a living organism.
2. The intermolecular spaces among solid molecules are ...., but .... in gases.
3. The attraction forces among gaseous molecules are ....
4. .... take the shape of the container, but .... has no definite shape.
5. The state of matter depends on .... and .... between molecules.
6. On heating a solid material, the increase in the .... of molecules occurs, so the .... among them increase.
7. In melting process, solid molecules .... energy and change into .... state.
8. During vaporization process, liquid molecules .... energy and change into .... st
9. Matter is composed of small building units called ...., while these units are composed of smaller units called ....
10. Molecules of one substance are .... in properties, but they .... from molecules o other substances.
11. Helium is considered from .... gases and its molecule is composed of .... atom(
12. The liquid element whose molecule composed of one atom is .... , while that composed of two atoms is ....

- 13. Molecules of active gases are formed of .... atom(s), while the molecules of inert gases are formed of .... atom(s).
- 14. Hydrogen molecule is consists of .... atom(s), while argon molecule (inert gas) is consists of .... atom(s).
- 15. Chlorine molecule is composed of .... atom(s), while xenon molecule is composed of .... atom(s).
- 16. The molecule of water is formed due to the combination of .... atoms with .... atom.
- 17. Hydrogen chloride compound is composed of .... atom and .... atom.

5. Complete the following tables :

1.

Points of comparison	Solids	Liquids	Gases
Molecules motion :	..........(1)..........	..........(2)..........	Very fast
Intermolecular spaces :	..........(3)..........	Intermediate	..........(4)..........
Intermolecular force :	Strong	..........(5)..........	..........(6)..........
Shape :	..........(7)..........	..........(8)..........	..........(9)..........
Volume :	..........(10)..........	Definite	..........(11)..........

2.

The molecule	Its type	Number and type of atoms
Water molecule :	..........(1)..........	..........(2)..........
..........(3)..........	Element molecule	Two atoms of oxygen
Hydrogen chloride molecule :	..........(4)..........	..........(5)..........
Ammonia molecule :	..........(6)..........	..........(7)..........

6. Complete the following diagram :



7. Give reasons for the following :

1. When you leave the perfume bottle opened you smell it all over the room.
2. • A drop of ink spreads through water.
   • When we put a small amount of potassium permanganate in a glass containing water , the colour of water changes into violet.

3. • When adding an amount of table salt to water it disappears after a time.
   • Disappearance of sugar when it is dissolved in water.
4. • The volume of a mixture of water and alcohol is less than the sum of their volumes before mixing.
   • On adding 300 cm^3 of water to 200 cm^3 of alcohol, it was found that their volumes toget became less than 500 cm^3.
5. It is very hard to break down (Fragmentize) a piece of iron with your fingers.
6. It is easy to divide an amount of water into small droplets.
7. The solid substances keep their shape whatever the container shape differs, while t liquid takes the shape of its container.
8. Gases have indefinite shapes and volumes.
9. The change of matter by heating from the solid state to the liquid state.
10. • When water gains energy, it converts into gas.
    • The change of matter by heating from the liquid state to the gaseous state.
11. Molecules of elements differ from molecules of compounds.
12. Oxygen is an element molecule, while hydrogen chloride is a compound molecule.
13. The molecule of helium differs from the molecule of hydrogen.
14. The properties of molecules of substances are different from each other.

8. Give an example of each of the following :

1. A solid matter.
2. A liquid matter.
3. A gaseous matter.
4. A liquid element composed of one atom.
5. A liquid element composed of two atoms.
6. An active gas.
7. A nobel gas.
8. A compound molecule consisting of three atoms.
9. A compound molecule consisting of four atoms.
10. A compound molecule consisting of two different atoms.

9. Define each of the following :

1. Molecule.
2. Melting process.
3. Vaporization process.
4. Element.
5. Compound.



10. What happens when ... ?

1. You open a perfume bottle in a closed room for a while.
2. You put a drop of ink in water.
3. You put an amount of table salt in a beaker containing water.
4. You add 50 cm^3 of ethyl alcohol to 100 cm^3 of water.
5. You try to break a piece of iron with your hand.
6. You heat a piece of solid matter for a long time to its melting point.
7. You heat an amount of water in a beaker to its boiling point.
8. Three atoms of hydrogen combine with one atom of nitrogen.

11. Choose the odd word out, then write the scientific term of the others :

1. Water – Oil – Alcohol – Water vapour.
2. Neon – Argon – Oxygen – Xenon.
3. Hydrogen – Helium – Chlorine – Fluorine – Nitrogen.
4. Ammonia – Water – Aluminium – Hydrogen chloride.
5. Fluorine – Water – Bromine – Carbon.

12. What are the properties of molecules ?

13. Compare between :

1. Solid, liquid and gaseous matter concerning :
   - The distance among molecules.
   - The intermolecular forces among molecules.
2. Water and ice with regard to the intermolecular spaces.
3. Iron and oxygen concerning :
   - Number of atoms.
   - Electric conduction.
   - Intermolecular forces.
   - Intermolecular spaces.
4. Element and compound.
5. Chlorine molecule and mercury molecule.
6. Water molecule and ammonia molecule.

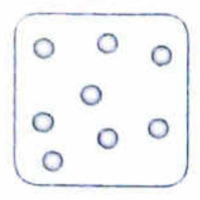
14. Show by an experiment that :

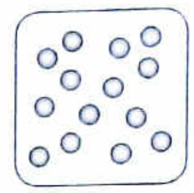
1. The substance is composed of small tiny molecules.
2. The substance molecules are in a state of continuous motion.
3. There are intermolecular spaces among molecules of matter.

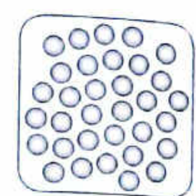
15. One of your relatives asks you why he smells your perfume although he is far from you, what is your explanation ?

16. Variant questions :

(1) From the following figures :


Fig. (A)


Fig. (B)


Fig. (C)

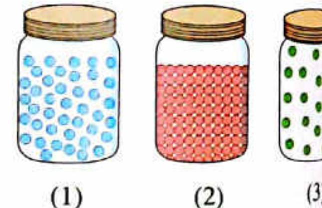
A. Mention the figure illustrating :

1. The liquid matter. 2. The solid matter. 3. The gaseous matter.

B. Complete :

1. By heating matter in fig. (C), it changes into matter in fig. (B) and this process is known as ....
2. By continuous heating, matter in fig. (B) changes into matter in fig. (A) and this process is known as ....

(2) Study the opposite figures, then answer :



1. Which of the figures represents the molecules of solid matter ? **(Give a reason).**
2. **Complete :** On heating matter (1) to .... point, it changes into .... state which is represented by the molecules of fig. (3).
3. Explain the effect of heat in changing the substance (2) into the substance (1).
4. **Choose :** The figure .... represents the state of matter that its molecules spread in any available space.

a. (1) b. (2) c. (3)

(3) Which of the following figures represents the element molecule and which of them represents the compound molecule ? Why ?

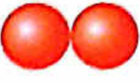

Fig. (1)


Fig. (2)


Fig. (3)


Fig. (4)


Fig. (5)



Thinking Skills Questions

1. Put (✓) or (×) and correct the wrong ones :

1. The molecules of water are more coherent than the molecules of air. ( )
2. When water boils, the intermolecular forces increase and the intermolecular spaces decrease. ( )

2. Choose the correct answer :

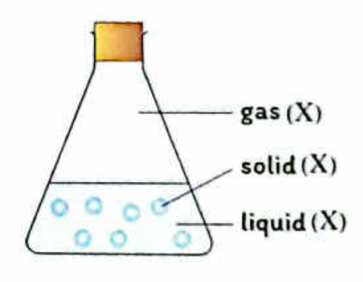
When water molecules are compared to water vapour molecules, water molecules are ....

a. slower and more distant.
b. faster and more distant.
c. slower and more closer together.
d. faster and more closer together.

3. Mention three compounds that can be formed from the following elements, then mention the number of atoms of each compound :

[Hydrogen – Oxygen – Nitrogen – Chlorine].

4. The opposite figure shows a conical flask contains a matter (X) in its three states.

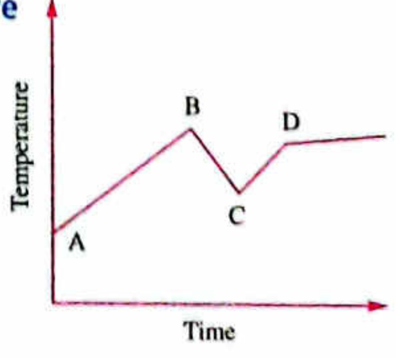


Which of the following statements is correct ?

a. The mass of molecule of gas (X) is less than that of molecule of liquid (X).
b. The molecules of liquid (X) vibrate around their positions.
c. The temperature of liquid (X) is more than the temperature of solid (X).
d. The matter (X) loses energy when it is converted from the solid state to the liquid state.

5. Compare between active gases and inert gases [according to their numbers – their names – number of atoms of the molecule].

6. Mai heated a beaker of water to a certain temperature in an experiment, then she added some ice cubes into the beaker of water.

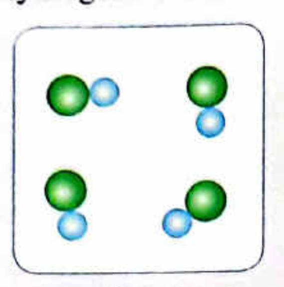


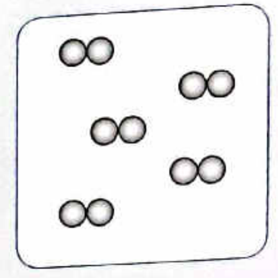
At which point of the graph where the ice cubes begins added to the beaker of water ?

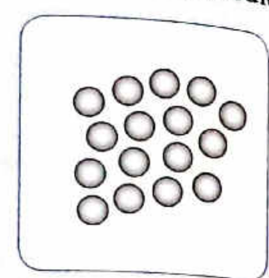
a. A
b. B
c. C
d. D

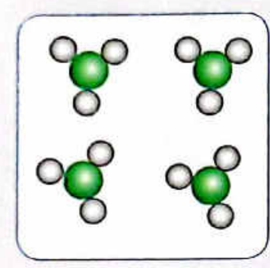
7. Choose the figure that represents each of the following :

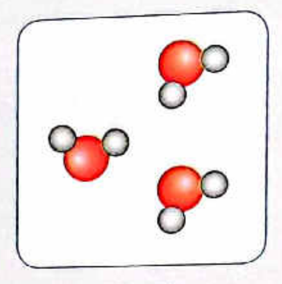
1. Hydrogen molecule.
2. Water molecule.
3. Helium molecule.
4. Hydrogen chloride molecule.
5. Ammonia molecule.
6. Iron molecule.

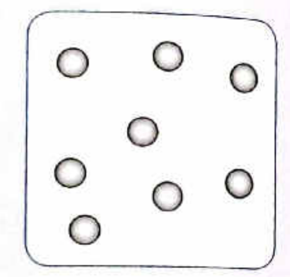

Fig. (A)


Fig. (B)


Fig. (C)


Fig. (D)


Fig. (E)


Fig. (F)

8. Which of the following figures indicates :

1. Melting process.
2. Vaporization process.

(then mention the reason).

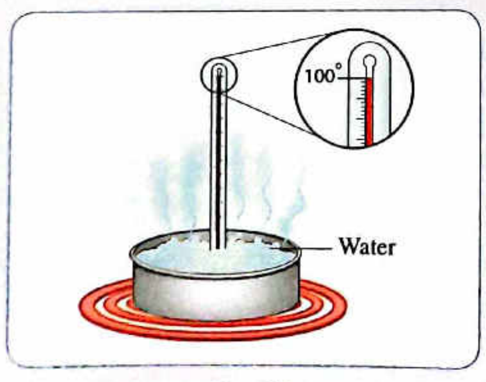


Fig. (A)

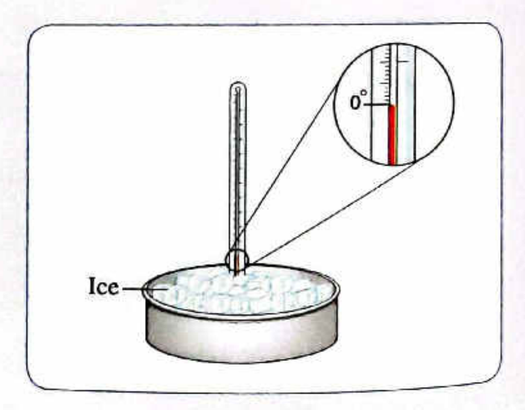
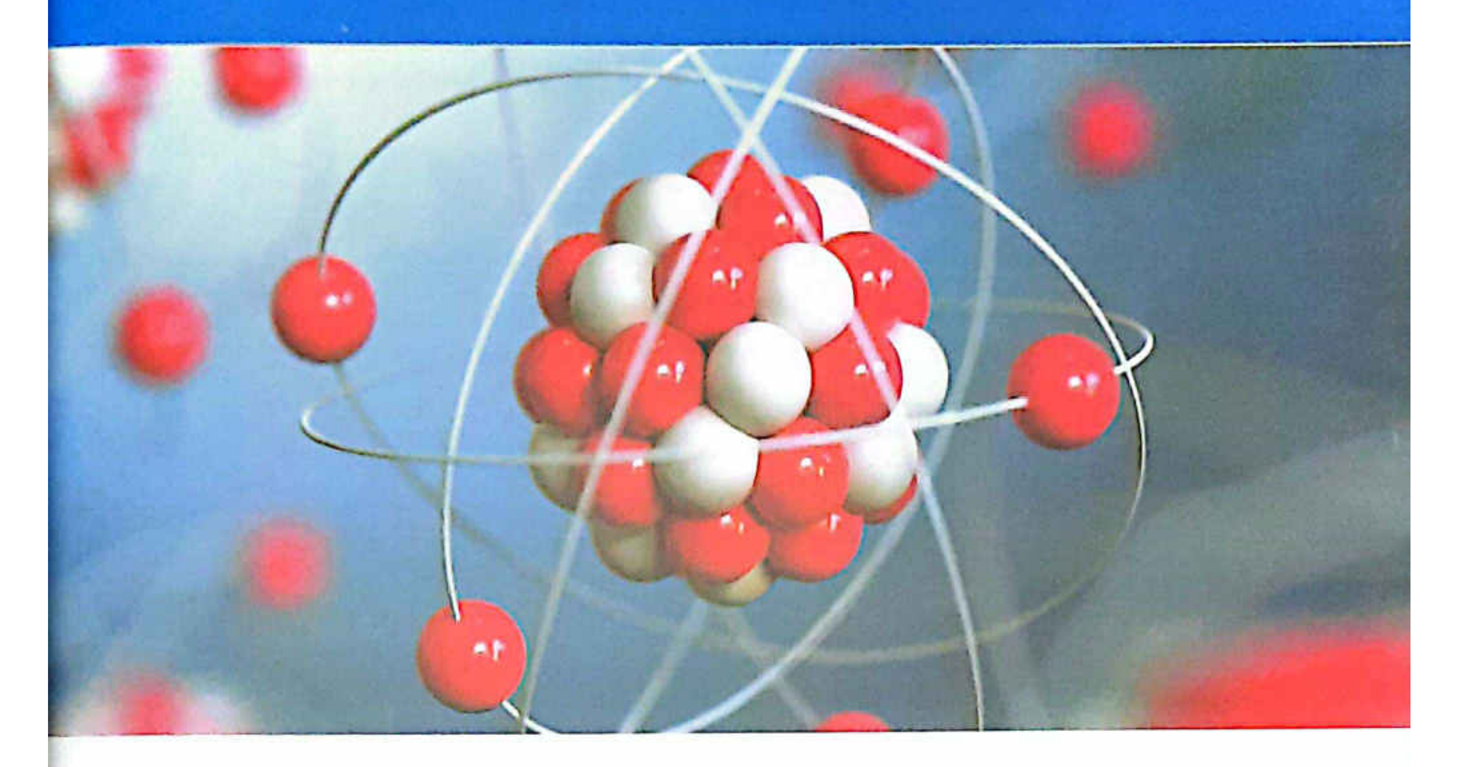


Fig. (B)

LESSON 3

Atomic Structure of Matter

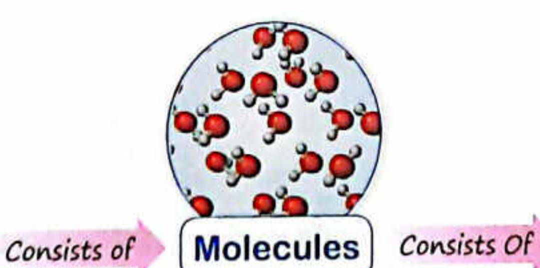


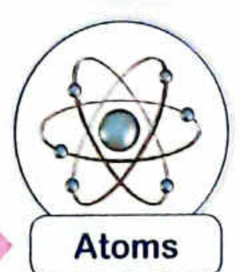
What is the structure of an atom?

In the previous lesson, you have studied the structure of matter, where :









- Chemists use symbols to express elements easily.
- The symbol represents one individual atom.

The atom

- It is the fundamental building unit of matter.
- It is the smallest individual unit of matter which can share in chemical reactions.

The chemical symbols of some elements

H	Hydrogen	Cl	Chlorine	He	Helium	Ar	Argon	Li	Lithium
K	Potassium	C	Carbon	Ca	Calcium	N	Nitrogen	Fe	Iron
O	Oxygen	Cu	Copper	F	Fluorine	Zn	Zinc	Ne	Neon
Br	Bromine	Na	Sodium	Ag	Silver	Mg	Magnesium	I	Iodine
Al	Aluminium	Au	Gold	Si	Silicon	Hg	Mercury	P	Phosphorus
Pb	Lead	S	Sulphur	B	Boron	Be	Beryllium	Cr	Chromium

➲ **From the previous examples, we find that :**

1 The symbol of the element is represented **by**

One letter (or) **Two letters**

C — It is written in **capital**.

Carbon symbol

The **first letter** is written in **capital** and the **second one** in **small**.



Sodium symbol

2 Some elements are common in their first letters, so the second letter is taken to differentiate between them, like : - **Carbon (C)** and **Calcium (Ca)**. - **Sulphur (S)** and **Silicon (Si)**. - **Hydrogen (H)** and **Helium (He)**.

3 The element symbol is derived from its **Latin name**, so that symbols of some elements differ from their names in **English language**.

➲ Examples

Element in English	Sodium	Potassium	Iron	Copper	Silver
Element in Latin	Natrium	Kalium	Ferrum	Cuprum	Argentum
Symbol	Na	K	Fe	Cu	Ag

Now, we will study :

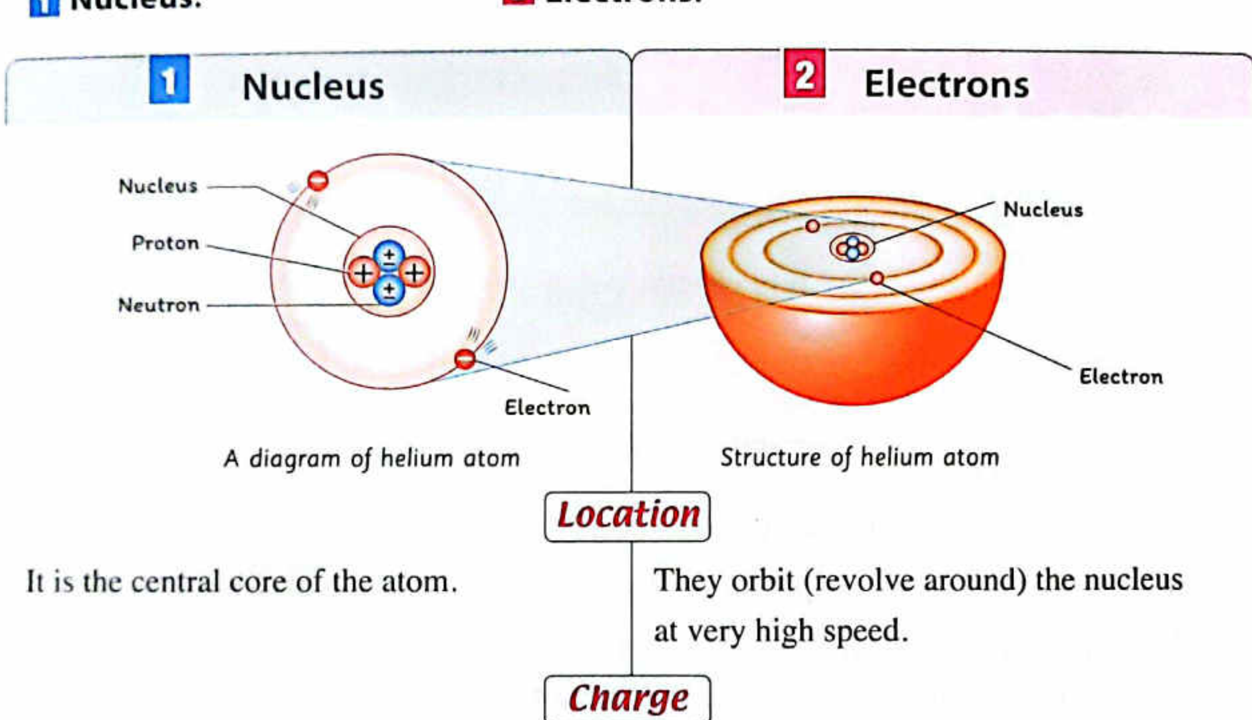
- Atomic construction of any element.
- Electronic distribution.

The atomic construction

- The scientists did many experiments to reach the atomic construction, where they found that the atom consists of :

1. Nucleus.
2. Electrons.

1 Nucleus	2 Electrons



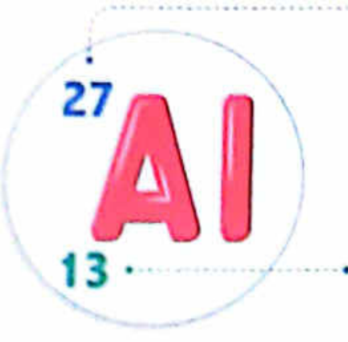
A diagram of helium atom

Structure of helium atom

	Nucleus	Electrons
Location	It is the central core of the atom.	They orbit (revolve around) the nucleus at very high speed.
Charge	**It is positively charged G.R.** Because it contains of : • **Protons :** positively charged particles ⊕. • **Neutrons :** electrically neutral particles (uncharged) ±.	They are negatively charged particles ⊖ and their number is equal to the number of positive protons in the neutral atom.
Mass	**The mass of the atom is concentrated in the nucleus G.R.** Because the electron has a negligible mass relative to that of the proton or neutron.	The electron has a negligible mass relative to that of the proton or neutron.

G.R. ***The atom is electrically neutral in its ordinary state.***
Because the number of negative electrons which revolve around the nucleus is equal to the number of positive protons in the nucleus.

- **To express an atom of any element, we use two terms, which are :**



The symbol of aluminium

Mass number

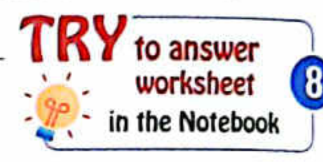
It is the sum of the numbers of protons and neutrons in the nucleus of an atom.

It is written above the symbol on the left side.

Atomic number

It is the number of protons in the nucleus of an atom.

It is written below the symbol on the left side.



What is meant by ...?

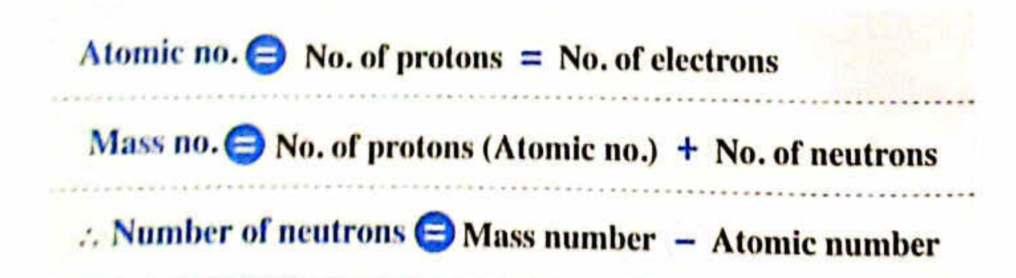
1. The atomic number of calcium atom equals 20 ?

This means that the number of protons in the nucleus of calcium atom equals 20

2. The mass number of calcium atom equals 40 ?

This means that the sum of the numbers of protons and neutrons in the nucleus of calcium atom equals 40

From all the previous explanation, we conclude that :



Atomic no. = No. of protons = No. of electrons

Mass no. = No. of protons (Atomic no.) + No. of neutrons

∴ Number of neutrons = Mass number − Atomic number

G.R. ***The mass number is always larger than the atomic number.***
Because the mass number equals the sum of the numbers of protons and neutrons in the nucleus, but the atomic number equals the number of protons only.

Question

Write the symbols of the following elements

1. Sodium. 2. Potassium. 3. Chlorine.
4. Nitrogen. 5. Calcium. 6. Aluminium.



1. **The nucleus of hydrogen atom doesn't contain neutrons, so the atomic number equals the mass number.**

2. **The number of neutrons may be :**
   - **Equal to** the number of protons as in ($^{12}_{6}C$).

   or

   - **More than** the number of protons as in ($^{23}_{11}Na$) , so the mass of the atom increases.

3. **If the number of protons changes :**
   - The value of the positive charge of the nucleus changes.
   - The values of the atomic number and mass number change.

   So, the element changes into another element.



Problems

1 ***If the nucleus of an oxygen atom contains 8 protons and 8 neutrons, find the atomic number and the mass number of oxygen and how the symbol of oxygen element is written.***

Solution

- The atomic number = No. of protons = 8
- The mass number = No. of protons + No. of neutrons = 8 + 8 = 16
- The symbol of oxygen element is ($^{16}_{8}O$).

---

2 ***If the nucleus of a sodium atom contains 11 protons and its mass number is 23, find the atomic number and the number of neutrons.***

Solution

- The atomic number = No. of protons = 11
- The number of neutrons = Mass number – Atomic number = 23 – 11 = 12

3 ***The opposite figure represents the structure of the nucleus of fluorine atom.***

Find : (1) Number of electrons. (2) Atomic number.

(3) Mass number. (4) The symbol of the atom.



Solution

(1) No. of electron = No. of protons = 9

(2) Atomic number = No. of protons = 9

(3) Mass number = No. of protons + No. of neutrons = 9 + 10 = 19

(4) The symbol of the atom is $\left({}^{19}_{9}F\right)$.



Exercise

Complete the following table :

Element symbol	Atomic number	Mass number	Number of protons	Number of electrons	Number of neutrons
${}^{12}_{6}C$	6	12	.......(a).......	6	6
${}^{23}_{11}Na$	.......(b).......	23	11	11	12
${}^{24}_{12}Mg$	12	24	12	.......(c).......	12
${}^{35}_{17}Cl$	17	.......(d).......	17	17	.......(e).......
${}^{40}_{18}Ar$	.......(f).......	40	18	18	.......(g).......

Answer a. 6 b. 11 c. 12 d. 35

e. 18 f. 18 g. 22

Comparison between the constituents of the atom :

Points of comparison	Proton	Neutron	Electron
1. Position :	In the nucleus.	In the nucleus.	Revolves around the nucleus.
2. Charge :	Positive (+)	Neutral (±)	Negative (−)
3. Mass :	Very large compared with electron mass.	Very large compared with electron mass.	Very small or negligible compared with proton or neutron mass.

Enrichment information

- ***Boyle, Dalton, Thomson, Rutherford and Bohr*** *are from scientists who contributed to the discovery of the atom construction.*
- *Atomic radius of an atom is measured in* ***Angestrom****.*
- *One Angestrom equals a part of ten thousands million parts of one metre (10^{-10} m).*

For Example :

- *The radius of hydrogen atom equals 0.3 Angestrom.*
- *This indicates how much the atom is small.*

The movement of electrons around the nucleus

Activity • To imagine the movement of electrons around the nucleus :



Steps:

1. Look at a turned-off electric fan.
2. Turn on the fan to make it rotates.



Observations:

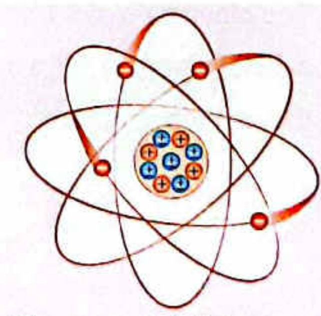
1. In the first step, you can see the arms of the fan clearly.
2. In the second step, you can't see the arms of the fan clearly and they seem to be as a cloud around the centre of the fan.



Conclusion:

Electrons are similar to the arms of the fan, where :

The electrons revolve around the nucleus at a very high speed in a number of shells (orbits) called **"Energy levels"**.



The movement of electrons around the nucleus

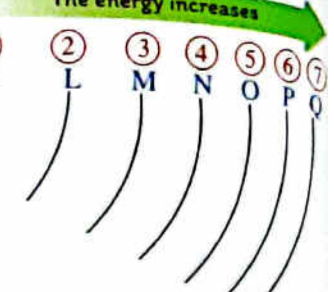
Energy levels

The energy levels

They are imaginary regions (places) around the nucleus in which the electrons move according to their energies.

- The maximum number of energy levels in the heaviest (largest) atoms is seven.
- The energy levels are arranged according to the nearer to the nucleus (from inside to outside) as follows :

Level symbol	K	L	M	N	O	P	Q
Level number (n)	1	2	3	4	5	6	7



- Each level has a certain amount of energy that increases by increasing the distance away from the nucleus.

➲ This means that :

- The first energy level (K) has the least energy.
- The seventh energy level (Q) has the highest energy.
- The energy of level (L) is greater than that of level (K) and is smaller than that of level (M) and so on.

Transferring of electrons from one energy level to another

- The energy of the electron depends on the energy of level which revolves in , where :

The energy of the electron = The energy of the level which revolves in

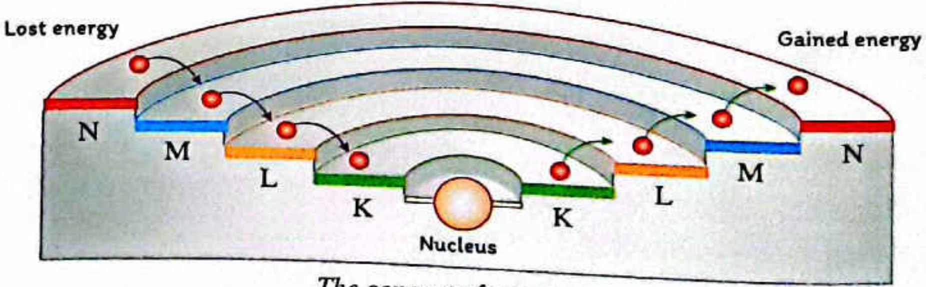
- The electron is not transferred from one level to a higher one unless it **gains** some energy called **"Quantum"** which equals the difference between the energies of two levels and the atom in this case is known as the **"Excited atom"**.

Quantum

It is the amount of energy lost or gained by an electron when it transfers from one energy level to another.

The excited atom

It is the atom that gains a quantum of energy.



The concept of quantum

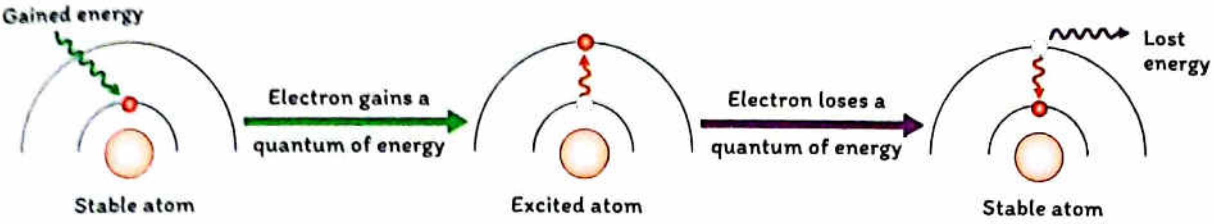
What happens when ...?

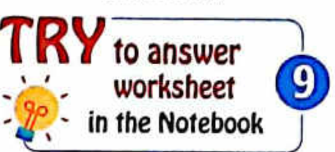
- **The electron gains a quantum of energy.**

  It will transfer to a higher energy level and atom becomes excited atom.

- **The electron in the excited atom loses a quantum of energy.**

  It returns to its original energy level and the atom returns to its original (ground) state.





Electronic distribution (configuration)

- Each energy level can take a definite number of electrons.
- The least levels of energy are filled with electrons firstly, then followed by the higher levels of energy.
- The number of electrons which saturates **the first four energy levels** can be calculated from the relation $2n^2$, where (n) is the **number of the energy level**.

- Electronic configuration according to the relation $2n^2$:

Level symbol	No. of level (n)	No. of electrons which saturates the level
K	1	$2 \times (1)^2 =$ **2** electrons
L	2	$2 \times (2)^2 =$ **8** electrons
M	3	$2 \times (3)^2 =$ **18** electrons
N	4	$2 \times (4)^2 =$ **32** electrons

G.R. **The relation $2n^2$ is not applied to the energy levels higher than four.**
Because the atom becomes unstable if the level contains more than 32 electrons.

NB The outermost energy level of any atom can't take more than 8 electrons except "K" level which is saturated with **2 electrons** only.

Example Write the electronic configuration of potassium atom ($^{39}_{19}K$).

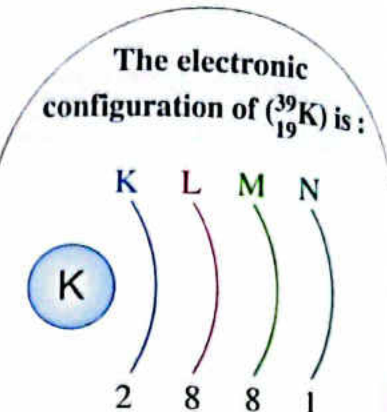
- The atomic number of potassium ($^{39}_{19}K$) is 19
- Number of protons = Number of electrons = 19
- The electronic configuration of potassium atom ($^{39}_{19}K$) on energy levels as follows :



The second energy level (L) is saturated with 8 electrons

The third energy level (M) is saturated with 8 electrons

The fourth energy level (N) is saturated with 1 electron

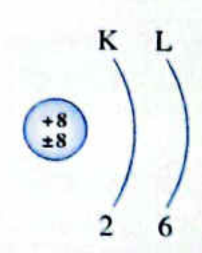




Exercise

From the opposite figure calculate :

1. Atomic number.
2. Mass number.
3. No. of neutrons.





1. 8 2. 16 3. 8

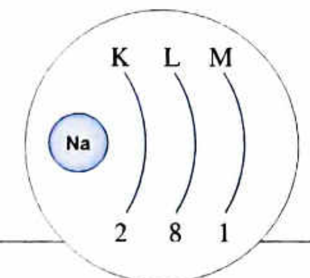
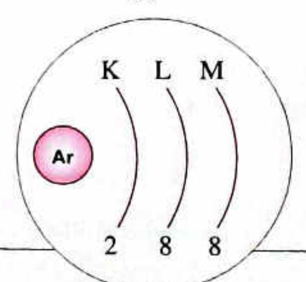
Question

Choose :

1. The second energy level in ($^{14}_{7}N$) atom contains .... electrons.
   a. 2 b. 3 c. 4 d. 5
2. The atomic number of an atom of an element, the "M" energy level of its atom contains 2 electrons is ....
   a. 8 b. 10 c. 12 d. 14

The electronic configuration and the chemical activity

The chemical activity of the atom of an element is determined related to the number of electrons in the outermost energy level as follows :

Active elements	Inactive (Inert) elements
• The outermost energy level **contains less** than 8 electrons.	• The outermost energy level is **completely filled** with 8 electrons (except He).
• **Atoms of active elements (unstable) take part in chemical reactions. G.R.** To produce stable molecules.	• **Atoms of inactive elements (stable) don't take part in chemical reactions in ordinary conditions. G.R.** Because the outermost energy levels are completely filled with electrons.
Example : Sodium ($^{23}_{11}Na$). 	**Example :** Argon ($^{40}_{18}Ar$). 



- The electrons of the outermost energy level are responsible for the chemical reactions.
- Helium ($^{4}_{2}He$) is the only inert gas that has 2 electrons in the outermost energy level (K).

Question

Choose :

1. The element whose atomic number is 10 and it doesn't take part in chemical reactions, it is similar in its chemical properties the element whose atomic number equals ....

a. 9 b. 11 c. 16 d. 18

2. All of the following elements are inactive elements except ....

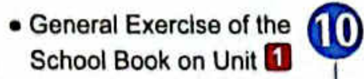
a. $_{2}He$ b. $_{15}P$ c. $_{18}Ar$ d. $_{10}Ne$

Let's study the electronic configuration and chemical activity of some atoms as shown in the following table :

Atom of element	Symbol	Atomic no.	Mass no.	Electronic configuration	Structure of the atom	Chemical activity
1. Hydrogen (The simplest atom)	$^{1}_{1}H$	1	1	Energy level — K; +1; Electron — 1	- No. of protons = 1 - No. of neutrons = 0 - No. of electrons = 1 (orbits in "K" level).	**Active** As its outermost energy level has **1 electron**.
2. Helium	$^{4}_{2}He$	2	4	K; +2 ±2; 2	- No. of protons = 2 - No. of neutrons = 2 - No. of electrons = 2 (orbit in "K" level).	**Inactive** As its outermost energy level is completely filled with electrons **2 electrons**.
3. Lithium	$^{7}_{3}Li$	3	7	K L; +3 ±4; 2 1	- No. of protons = 3 - No. of neutrons = 4 - No. of electrons = 3 (2 orbit in "K" level and 1 in "L" level).	**Active** As its outermost energy level has **1 electron**.
4. Nitrogen	$^{14}_{7}N$	7	14	K L; +7 ±7; 2 5	- No. of protons = 7 - No. of neutrons = 7 - No. of electrons = 7 (2 orbit in "K" level and 5 in "L" level).	**Active** As its outermost energy level has **5 electrons**.
5. Oxygen	$^{16}_{8}O$	8	16	K L; +8 ±8; 2 6	- No. of protons = 8 - No. of neutrons = 8 - No. of electrons = 8 (2 orbit in "K" level and 6 in "L" level).	**Active** As its outermost energy level has **6 electrons**.
6. Neon	$^{20}_{10}Ne$	10	20	K L; +10 ±10; 2 8	- No. of protons = 10 - No. of neutrons = 10 - No. of electrons = 10 (2 orbit in "K" level and 8 in "L" level).	**Inactive** As its outermost energy level is completely filled with electrons **8 electrons**.

7. Sodium	$^{23}_{11}Na$	11	23	Nucleus: +11, ±12; K L M: 2 8 1	- No. of protons = 11 - No. of neutrons = 12 - No. of electrons = 11 (2 orbit in "K" level, 8 in "L" level and 1 in "M" level).	**Active** As its outermost energy level has **1 electron**.
8. Magnesium	$^{24}_{12}Mg$	12	24	Nucleus: +12, ±12; K L M: 2 8 2	- No. of protons = 12 - No. of neutrons = 12 - No. of electrons = 12 (2 orbit in "K" level, 8 in "L" level and 2 in "M" level).	**Active** As its outermost energy level has **2 electrons**.
9. Aluminium	$^{27}_{13}Al$	13	27	Nucleus: +13, ±14; K L M: 2 8 3	- No. of protons = 13 - No. of neutrons = 14 - No. of electrons = 13 (2 orbit in "K" level, 8 in "L" level and 3 in "M" level).	**Active** As its outermost energy level has **3 electrons**.
10. Chlorine	$^{35}_{17}Cl$	17	35	Nucleus: +17, ±18; K L M: 2 8 7	- No. of protons = 17 - No. of neutrons = 18 - No. of electrons = 17 (2 orbit in "K" level, 8 in "L" level and 7 in "M" level).	**Active** As its outermost energy level has **7 electrons**.
11. Argon	$^{40}_{18}Ar$	18	40	Nucleus: +18, ±22; K L M: 2 8 8	- No. of protons = 18 - No. of neutrons = 22 - No. of electrons = 18 (2 orbit in "K" level, 8 in "L" level and 8 in "M" level).	**Inactive** As its outermost energy level is completely filled with electrons **8 electrons.**

TRY to answer worksheet




- General Exercise of the School Book on Unit 1
- Model Exams on Unit 1

in the Notebook

Remember Lesson Three



The atom :

- It is the fundamental building unit of matter.
- It is the smallest individual unit of matter which can share in chemical reactions.

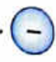
The atom consists of :

1. **Nucleus** which contains :

   Protons : Positively charged particles. (+)

   Neutrons : Electrically neutral particles. (±)

2. **Electrons :**

   Negatively charged particles. 

Mass number :

It is the sum of the numbers of protons and neutrons in the nucleus of an atom.

Atomic number :

- It is the number of protons in the nucleus of an atom.

- Atomic no. = No. of protons = No. of electrons
- Mass no. = No. of protons (Atomic no.) + No. of neutrons

∴ Number of neutrons = Mass number – Atomic number

Energy levels :

- They are imaginary regions around the nucleus in which the electrons move according to their energies.
- The maximum number of energy levels in the heaviest (largest) atoms is seven.

Quantum :

It is the amount of energy lost or gained by an electron when it transfers from one energy level to another.

The excited atom :

- It is the atom that gains a quantum of energy.

- The number of electrons which saturates **the first four energy levels** can be calculated from the relation $2n^2$, where (n) is the **number of the energy level**.

- The chemical activity of an atom of an element depends on the **number of electrons** in the outermost energy level.

Questions  on lesson Three


Interactive Exercises

• Remember • Understand • Apply • Higher skills School book questions.

1. Choose the correct answer :

1. The symbol of copper atom is ....
   a. C b. Co c. Cu d. Ca

2. The chemical symbol of nitrogen atom is ....
   a. Na b. No c. N d. Ne

3. Pb is the symbol of .... atom.
   a. phosphorus b. bromine c. lead d. potassium

4. Silver is symbolized by ....
   a. Hg b. Au c. Cu d. Ag

5. The atom nucleus contains ....
   a. protons and neutrons.
   b. protons and electrons.
   c. neutrons and electrons.
   d. protons, neutrons and electrons.

6. .... are neutral particles exist in the nucleus.
   a. Protons b. Molecules c. Neutrons d. Electrons

7. The atomic number of the atom of an element equals the ....
   a. number of protons revolving around the nucleus.
   b. number of neutrons in the nucleus.
   c. number of electrons in the nucleus.
   d. number of protons in the nucleus.

8. The sum of the numbers of protons and neutrons in the nucleus of the atom is known as ....
   a. atomic number. b. mass number. c. valency. d. density.

9. The mass of the atom is concentrated in the ....
   a. protons. b. nucleus. c. neutrons. d. electrons.

10. Sodium atom ($^{23}_{11}Na$) has a number of neutrons equals ....
    a. 11 b. 23 c. 12 d. 34

11. The mass number of an atom having 13 electrons and 14 neutrons equals ....
    a. 13 b. 14 c. 27 d. 1

12. The atomic number of an element having 6 protons in its nucleus is ....
    a. 6 b. 11 c. 12 d. 27

13. The nucleus of ………… atom doesn't contain neutrons.
a. neon   b. oxygen   c. nitrogen   d. hydrogen

14. When atomic number of an element equals its mass number. This means that there aren't ………… in the nucleus of this element.
a. electrons   b. protons   c. neutrons   d. atoms

15. Negative charged particles of negligible mass are …………
a. neutrons.   b. protons.
c. electrons.   d. molecules.

16. The particles which revolve around the nucleus of an atom of element are …………
a. neutrons.   b. protons.   c. electrons.   d. molecules.

17. The maximum number of energy levels in the heaviest known atoms is …………
a. 9   b. 7   c. 5   d. 4

18. The energy of the electron is ………… that of the level which it revolves in.
a. more than   b. less than   c. equal to   d. double

19. The energy of the excited atom is ………… the energy of the atom in its ground state.
a. more than   b. less than   c. equal to   d. half

20. The number of electrons that saturates the first four energy levels can be calculated from the relation …………
a. n   b. n^2 c. $2n^2$ d. 2n

21. The rule $2n^2$ can't be applied to the ………… energy level.
a. K   b. L   c. M   d. O

22. The third energy level is saturated with ………… electrons.
a. 2   b. 8   c. 18   d. 32

23. The outermost energy level of neon atom ($_{10}Ne$) contains ………… electrons.
a. 2   b. 8   c. 18   d. 32

24. The electrons of potassium atom ($_{19}K$) are distributed in ………… energy level(s).
a. one   b. two   c. three   d. four

25. Which of the following diagrams represents the diagrammatic sketch of fluorine atom ($^{19}_{9}F$) ? …………

a.   b.   c.   d.

26. All of the following atoms have one electron in the outermost energy level except …………
a. $^{7}_{3}Li$ b. $^{40}_{20}Ca$ c. $^{23}_{11}Na$ d. $^{1}_{1}H$

27. The element that has 3 electrons in the outermost energy level is ....

a. $^{7}_{3}Li$ b. $^{27}_{13}Al$ c. $^{23}_{11}Na$ d. $^{35}_{17}Cl$

28. The atomic number of an element has 2 electrons in "L" level is ....

a. 2 b. 4 c. 6 d. 8

29. The second energy level in $(^{14}_{7}N)$ atom contains .... electrons.

a. 2 b. 3 c. 4 d. 5

30. The chemical activity of the element depends on the number of ....

a. electrons in the outer level. b. levels filled with electrons.

c. neutrons. d. protons.

31. All of the following elements are active elements except ....

a. $_{1}H$ b. $_{6}C$ c. $_{7}N$ d. $_{18}Ar$

32. All of the following elements are inactive elements except ....

a. $_{2}He$ b. $_{15}P$ c. $_{18}Ar$ d. $_{10}Ne$

33. All of the following atoms can take part in the formation of chemical compounds in ordinary conditions except .... atom.

a. $_{17}Cl$ b. $_{6}C$ c. $_{8}O$ d. $_{10}Ne$

2. Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Iron	a. K
2. Sodium	b. C
3. Gold	c. Cu
4. Copper	d. Fe
5. Potassium	e. Na
6. Carbon	f. Au
	g. Ca

3. Put (✓) in front of the right statement and (✗) in front of the wrong one and correct it :

1. (He) is the symbol of hydrogen element, while (H) is the symbol of helium element. ( )
2. The chemical symbol of sulphur is (C). ( )
3. Neutrons exist in the nucleus and carry positive charges. ( )
4. Mass number is the sum of protons and electrons in the nucleus. ( )
5. The mass of the atom is concentrated in the nucleus. ( )
6. The number of protons is often equal to or less than the number of neutrons. ( )

7. The mass number is written below the symbol of the element on the left side. ( )
8. The maximum number of energy levels in the heaviest known atoms equals (9). ( )
9. The energy level "K" has the highest energy. ( )
10. The energy of level "N" is less than that of level "M". ( )
11. The electron transfers from its energy level to a higher energy level when it loses a quantum of energy. ( )
12. The number of electrons which saturates the energy levels can be calculated from the relation (n^2). ( )
13. The nearest energy level to the nucleus is the "K" level, which is saturated with 8 electrons. ( )
14. The fourth energy level "N" is saturated with 32 electrons. ( )
15. The outermost energy level of calcium atom ($^{40}_{20}Ca$) contains 6 electrons. ( )
16. Both sodium ($_{11}Na$) and aluminium ($_{13}Al$) have the same number of electrons in the energy level "L". ( )
17. The outermost energy level of magnesium atom ($^{24}_{12}Mg$) contains 3 electrons. ( )
18. Argon atom ($^{40}_{18}Ar$) has four energy levels. ( )
19. The outermost energy level of the atom of an active element contains 8 electrons. ( )
20. All noble gases are active elements. ( )
21. All inert gases have 8 electrons in their outermost energy level except helium. ( )
22. Nitrogen ($_7N$) is an active element, while neon ($_{10}Ne$) is an inactive one. ( )

4. Write the scientific term of each of the following :

1. • The smallest particle that can share in the chemical reaction.
   • The smallest unit of matter construction which share in the chemical reactions.
2. The positively charged particles in the nucleus of an atom.
3. Neutral particles exist in the nucleus of an atom.
4. • The number of positive protons in the nucleus.
   • The number of negative electrons that rotate around the nucleus.
5. The sum of the numbers of protons and neutrons in the nucleus.
6. Particles which are negatively charged and negligible mass that revolve around the nucleus.
7. Imaginary places in which the electrons can move according to their energies.
8. The energy level that has the highest energy.
9. The energy level that has the lowest energy.

- 10. • [..] Energy needed or lost to transfer an electron from an energy level to another.
  - The difference in the energy of the electron that necessary to change the state of atom from ground state to excited state.
- 11. The atom that gains a quantum of energy.
- 12. The energy level that is saturated with 18 electrons.
- 13. • The gases that do not take part in the chemical reaction.
  - Elements which have 8 electrons in their outermost energy levels.
- 14. Elements which have less than 8 electrons in their outermost energy levels.
- 15. The inactive gas that has 2 electrons in its outermost energy level.

5. Complete the following statements :

- 1. The symbol of sodium atom is ………, while that of sulphur atom is ………
- 2. (Au) is the symbol of ……… element, while (Ag) is the symbol of ……… element.
- 3. The smallest part of the element that can take part in a chemical reaction is known as ………
- 4. The atom consists of two main parts which are ……… and ………
- 5. The mass number is the sum of ……… number and ……… number which exist in the nucleus.
- 6. The number of ……… in the nucleus of an atom is often equal to or greater than the number of ………
- 7. If the number of protons changes, the values of ……… number and ……… number change.
- 8. Electrons are particles with ……… charges, while protons are particles with ……… charges.
- 9. If the mass number of an element is 35 and it has 18 neutrons in its nucleus, therefore the number of electrons is ……… and its atomic number is ………
- 10. The number of neutrons = ……… number – ……… number.
- 11. The symbol of the second energy level is ………, while that of the fourth one is ………
- 12. As we go further from the nucleus, the energy of the levels ………
- 13. The energy level that has the highest energy is ………, while ……… level has the lowest energy.
- 14. When an electron near the nucleus moves to a higher energy level, it ……… a quantum of energy, and the atom becomes ……… atom.
- 15. When an electron transfers from "M" level to "N" level, it ……… a quantum of energy, but when it transfers from "P" level to "O" level, it ……… a quantum of energy.

16. The maximum number of electrons that saturates a given energy level is obtained from the rule .... which is applied only to the first .... energy levels.

17. The second energy level "L" is saturated with .... electrons, while the fourth one "N" is saturated with .... electrons.

18. The atomic number of a neutral atom having 3 electrons in "M" energy level equals ....

19. Electrons of sodium atom ($_{11}Na$) are distributed in a number of energy levels equals ....

20. The outermost energy level of chlorine atom ($_{17}Cl$) contains .... electrons so, it is considered from .... elements.

21. The energy level "L" of carbon atom ($_{6}C$) contains .... electrons, while that of sulphur atom ($_{16}S$) contains .... electrons.

22. The outermost energy level of argon atom ($_{18}Ar$) has .... electrons so, it is considered from .... elements.

23. Noble gases have 8 electrons in the outermost energy level except .... which has .... electrons.

24. Active elements should have .... than 8 electrons in their outermost energy levels, so they can react chemically with another atom to produce a molecule in a .... state.

6. Complete the following table :

Element name	Chemical symbol	Atomic no.	Mass no.	No. of protons or No. of electrons	No. of neutrons	Electronic configuration K	L	M	N	Chemical activity
Calcium	....	....	....	20	20	....	8	....	....	....
....	$^{19}_{9}F$	....	19	....	....	....	....	—	—	....
Oxygen	....	....	....	....	8	....	6	—	—	....
....	$^{...}_{18}Ar$	18	....	....	22	....	....	....	—	....
Potassium	....	....	39	....	20	....	....	....	....	....
....	$^{20}_{10}Ne$	....	20	....	....	2	....	—	—	....
Magnesium	....	12	....	....	12	....	....	....	—	....

7. Give reasons for the following :

1. Carbon is symbolized by one letter, while calcium is symbolized by two letters.
2. The symbol of sodium is (Na) not (So) as it is expected.
3. The atom is electrically neutral.
4. The mass of the atom is concentrated in the nucleus.
5. The nucleus has a positive charge.
6. The mass number is greater than the atomic number.
7. In hydrogen atom, the atomic number equals the mass number.
8. Electrons are distributed to fill the "K" level before filling the "L" level.
9. • The energy level "M" in the atom isn't saturated by more than 18 electrons.
   • The 3^{rd} energy level "M" in the atom contains 18 electrons.
10. The rule ($2n^2$) is not applied on the energy levels higher than four.
11. The number of electrons in the outermost energy level determines the chemical activity of the element.
12. The number of electrons in the outermost energy level in lithium atom ($^{7}_{3}Li$) is equal to that of sodium atom ($^{23}_{11}Na$).
13. The electrons of ($_{12}Mg$) and ($_{17}Cl$) are distributed in the same number of energy levels.
14. Atoms of active elements take part in the chemical reaction.
15. • Inert gases can't share in chemical reactions in ordinary state.
    • The atoms of inert gases are stable.
16. Neon atom ($^{20}_{10}Ne$) doesn't enter in the chemical reaction through the ordinary conditions.
17. Nitrogen atom ($^{14}_{7}N$) enter in the chemical reaction.
18. Sodium atom is active, while argon atom is inactive.

8. What is meant by ... ?

1. The atom.
2. Atomic number.
3. The atomic number of lithium atom is (3)
4. Mass number.
5. The mass number of oxygen atom is (16)
6. Energy levels.
7. Quantum.
8. Excited atom.

9. What happens when ... ?

1. The nucleus of an atom of an element doesn't contain neutrons.
2. The number of protons changes.
3. • The electron gains a quantum of energy.

- The energy of the electron becomes more than the energy of the level in which the electron rotates.
- The electron gains some energy which equals to the difference between the energies of two levels.

4. The electron in the excited atom loses a quantum of energy.
5. The outermost energy level of an atom isn't completely filled with electrons.

10. Choose the odd word (or symbol) out, then write the scientific term of the others

1. Protons – Neutrons – Electrons – Quantum.
2. $^{23}_{11}Na$ – $^{27}_{13}Al$ – $^{35}_{17}Cl$ – $^{40}_{20}Ca$
3. $_{3}Li$ – $_{11}Na$ – $_{12}Mg$ – $_{19}K$
4. $_{20}Ca$ – $_{16}S$ – $_{7}N$ – $_{18}Ar$

11. Compare between :

1. Atomic number and mass number.
2. Protons, neutrons and electrons **(concerning : charge – position – mass)**.
3. Aluminium atom ($^{27}_{13}Al$) and argon atom ($^{40}_{18}Ar$) **(concerning : number of neutrons – number of electrons in the outermost energy level – chemical activity)**.
4. The energy level "L" and the energy level "M" **(concerning : number of level – number of electrons which saturates the level)**.
5. Active elements and inactive elements.

12. Write the symbols of the following elements :

1. Sodium.
2. Potassium.
3. Chlorine.
4. Nitrogen.
5. Calcium.
6. Aluminium.
7. Phosphorus.

13. Write the names of the elements of the following symbols :

1. H
2. He
3. Au
4. Ag
5. Pb
6. S
7. Si
8. Ar
9. I
10. Cu
11. Br
12. C
13. Hg
14. Fe
15. O
16. Ne

14. Show by drawing the electronic configuration for each of the following atoms :

1. $^{4}_{2}He$
2. $^{7}_{3}Li$
3. $^{14}_{7}N$
4. $^{16}_{8}O$
5. $^{20}_{10}Ne$
6. $^{24}_{12}Mg$
7. $^{35}_{17}Cl$
8. $^{39}_{19}K$

15. What is the importance of ... ?

1. The chemical symbols of elements.
2. Electrons of the outermost energy level.

16. Variant questions :

- **(1) What is the mathematical relationship by which you can calculate the following :**
  1. The number of electrons in each energy level.
  2. Mass number of an atom.
  3. The number of neutrons in nucleus.
- **(2) If the nucleus of carbon atom contains 6 protons and 6 neutrons.**
  Find the atomic and mass numbers.
- **(3) One of your classmates asked you to explain why magnesium $^{24}_{12}Mg$ and sodium $^{23}_{11}Na$ atoms are different in both atomic and mass numbers.**
  How do you explain this difference?
- **(4) An element whose mass number is 23 and its atomic number is 11. Show its electronic configuration.**
- **(5) If you are given an element with atomic number 20, mass number 40. Complete :**
  1. Number of electrons = ...
  2. Number of protons = ...
  3. Number of neutrons = ...
  4. The second energy level of this atom contains .... electrons.
- **(6) Electrons rotate around the nucleus in imaginary regions called energy levels :**
  1. Show by drawing, the energy levels around the nucleus.
  2. How many energy levels are there in the heaviest atoms ?
  3. What are the symbols of these levels?
  4. Arrange these levels in an ascending order according to their energies.
- **(7) An element, whose electrons are distributed in three energy levels and one electron revolves in its outermost level, mention :**
  1. Its atomic number.
  2. The symbol of the element.
  3. The symbol of the element which reacts with it when it is exposed to air.
- **(8) Write the electronic configuration of the following elements, then :**

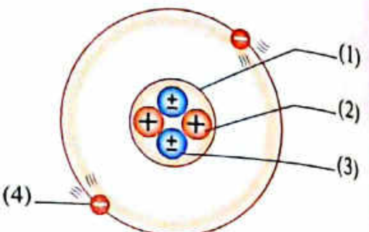
  $$^{7}_{3}Li - ^{4}_{2}He - ^{24}_{12}Mg - ^{35}_{17}Cl - ^{23}_{11}Na$$

  1. Find the number of electrons in the outermost energy level of each atom.
  2. Calculate the number of neutrons in each atom.
- **(9) An element whose electrons are distributed in four energy levels and the number of electrons that revolve in the last level is equal to that in the first. If its mass number is doubled its atomic number, calculate :**
  1. Atomic number.
  2. Mass number.
  3. Number of neutrons.

(10) If you have three elements $^{23}_{11}Na$, $^{27}_{13}Al$, $^{4}_{2}He$. Show :

1. Which of these elements is used in manufacturing of electric wires ? Give a reason.
2. Which of these elements doesn't enter in chemical reactions ?
3. Which of these elements is very active ?
4. The element He is used in .... and the number of atoms of its molecule is .... **[Complete].**

(11) The following figure represents a sketch of the atom of an element.
Label the figure.



(12) Which of the following figures represents an oxygen atom, giving a reason for your answer :

1. In its ordinary (ground) state.
2. In excited state.

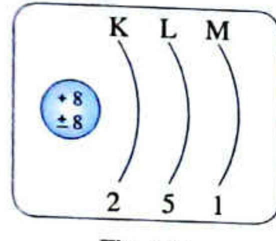


Fig. (1)

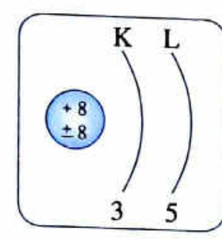


Fig. (2)

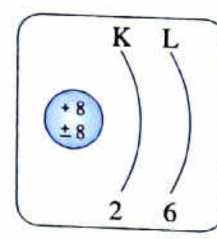


Fig. (3)

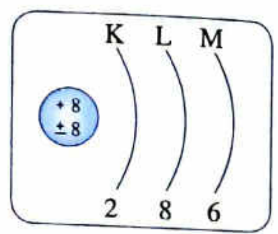


Fig. (4)

(13) The following figures represent a sketch of the electronic configuration of the atoms of some elements.

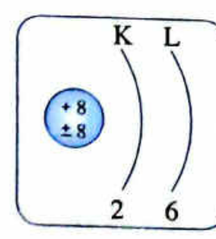


Fig. (1)

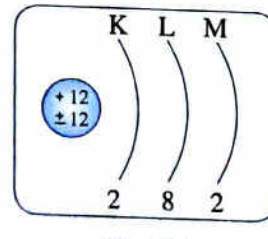


Fig. (2)

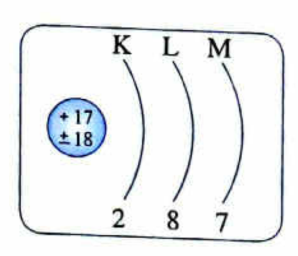


Fig. (3)

Study these figures well then determine each of the following :

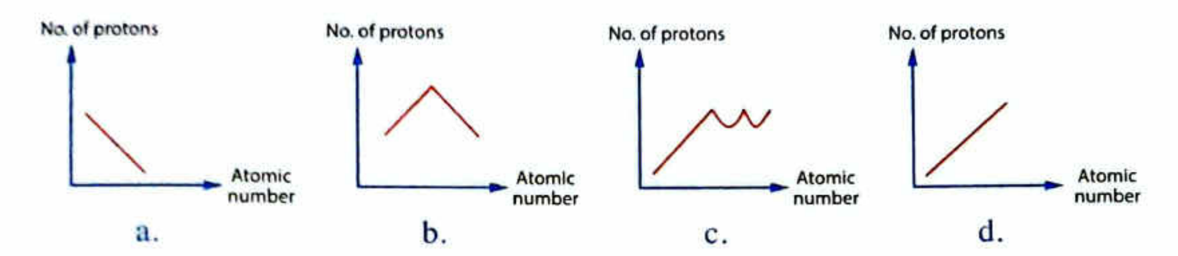
1. Atomic number of each atom.
2. Mass number of each atom.
3. No. of electrons in the outermost level.
4. Number of energy levels having electrons.



Thinking Skills Questions

1. Choose the correct answer :

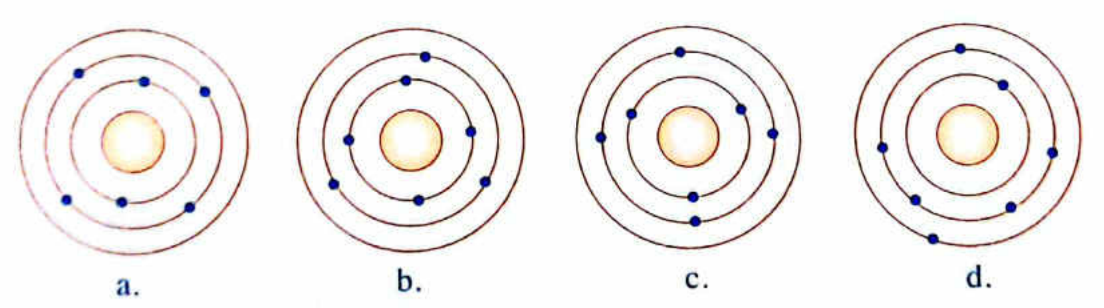
1. The figure .... represents the relation between the atomic number and no. of protons.



2. The element whose atomic number is 10 and it doesn't take part in chemical reactions, it is similar in its chemical properties the element whose atomic number equals ....

a. 9 b. 11 c. 16 d. 18

3. Which of the following atoms represents an excited atom ? ....



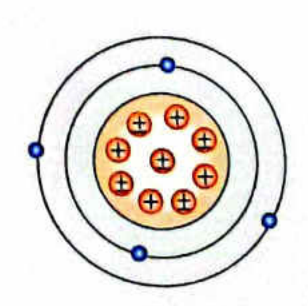
4. The atomic number of an atom of an element, the "M" energy level of its atom contains 2 electrons is ....

a. 8 b. 10 c. 12 d. 14

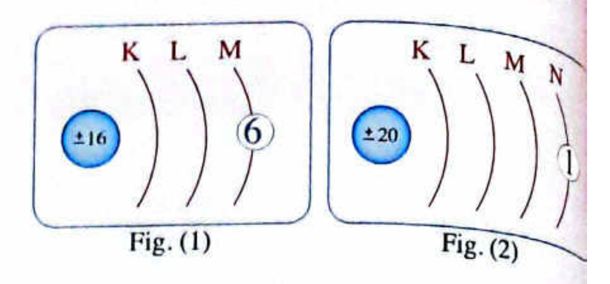
5. The opposite figure represents the atom of beryllium element, which its symbol is ....

a. $^{9}_{4}Be$ b. $^{5}_{4}Be$

c. $^{4}_{9}Be$ d. $^{9}_{5}Be$

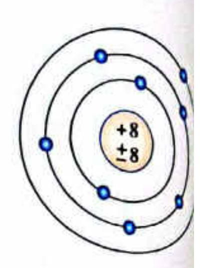


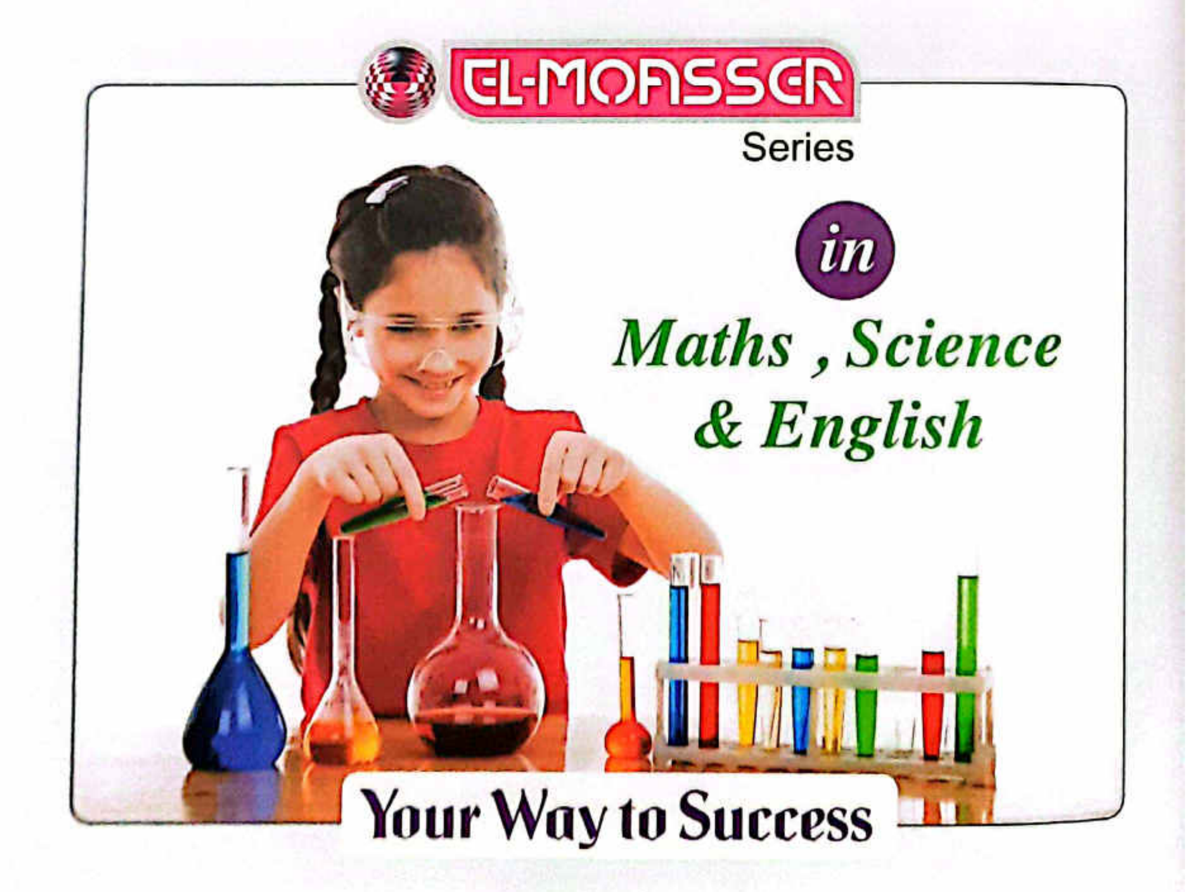
2. The opposite figures represent the electronic distribution of two atoms of two elements.



Determine the atomic number and mass number for each element.

3. The opposite diagram represents an oxygen atom. Is this atom in its normal state or in an excited state ? And give reasons for your answer.





Project

On UNIT ONE



A project to develop the analytical thinking

"General properties"

Complete the following table with the sign (✓) or (✗), then conclude from the table the general properties of some metals.

Properties	Metals					
	Gold	Copper	Mercury	Iron	Sodium	Platinum
- Reacts instantly with water.						
- Bad condutor of heat.						
- Does not dissolve in water.						
- Exists in a solid state.						
- Has high melting point.						
- Its density is lower than the water density.						

UNIT 2

Energy

Lesson 1	Energy ; Resources and Forms.
Lesson 2	Energy Transformations.
Lesson 3	Heat Energy.

Unit Objectives :

By the end of this unit, students will be able to :

- Identify the energy concept.
- Identify the energy resources.
- Deduce energy forms.
- Illustrate experimentally conversion of chemical energy into the other forms of energy.
- Compare between potential and kinetic energies.
- Compare among the other energy forms.
- Identify heat concept.
- Explain the relation between temperature and speed of particles.
- Illustrate the benefits of technology in using energy resources.
- Identify the negative influence of technology.
- Mention examples of technology applications in the domain of energy transformations.
- Design with some colleagues a simple electric cell from the materials of local environment.
- Design a simple electric circuit to show the flow of electric current.
- Numerate energy forms which we can obtain from the Sun.
- Appreciate the God's blessing of energy in the universe.

LESSON **1**

Energy; Resources and Forms



Why do we care about energy?

We need energy in different fields in our life.



Energy

It is the ability to do work or to make a change.

- **The measuring unit of energy is the joule.**

We provide cars with fuel **G.R.**	We eat food **G.R.**
- Because combustion of fuel in the car engine produces energy which enables the car to move (to do work).	- Because combustion of food in the human body produces energy which enables the body to carry out various activities (to do work).





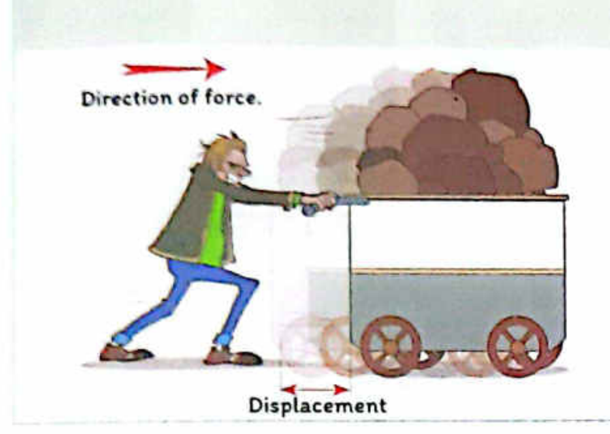
Therefore

Fuel inside the car is similar to the food inside the body of the living organism.

Work

When a force acts on a body to move a distance (displacement) in the same direction of such force, it is said that work is done on such object, So :

- When the displacement **increases**, the work done **increases**.

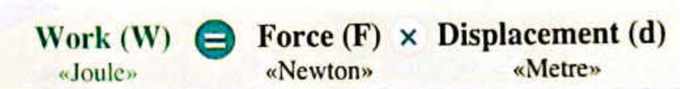


- When a person affects a wall by a force, he can't do work **G.R.**

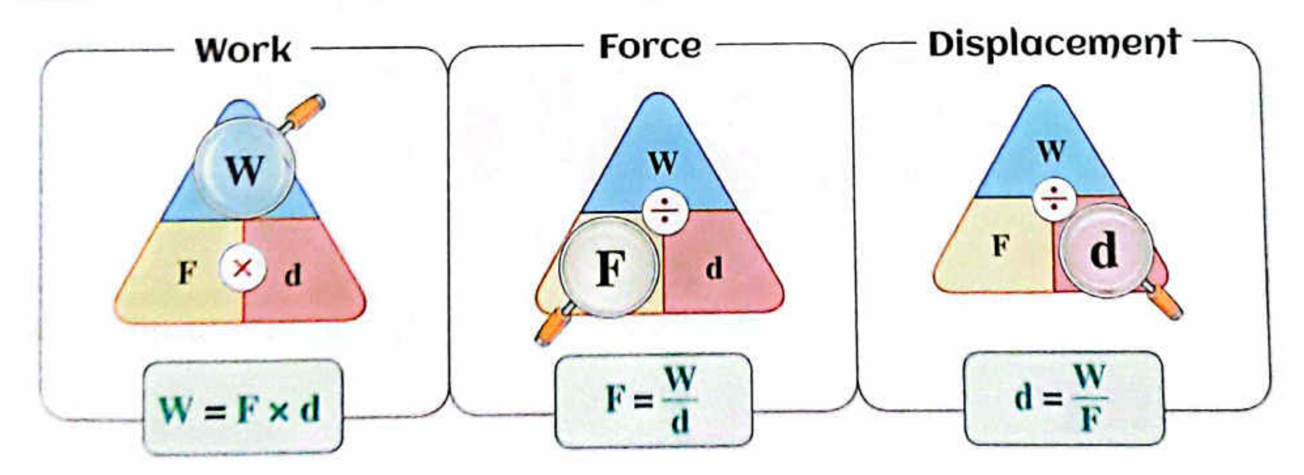
Because the displacement equals zero.



- Work can be determined from the opposite relation :



To calculate the Work, Force and Displacement :



Problem

Calculate the work done when a force of 65 newton acted on a body to move it to a distance of 10 metres in the direction of the force.

Solution

$W = F \times d = 65 \times 10 = 650$ joule

Resources of energy



G.R.

- ***The developed countries aim to use the solar energy (energy produced from the Sun), wind energy and the movement of water more than before.***
  Because the Sun is a permanent resource, while wind and the movement of water are renewable resources which are cheap resources and do not pollute the environment.

- ***The person who pushes the wall does not do work.***
  Because he does not move the wall a distance.

Forms of energy

1 **Light** energy	As the energy produced from :	• The Sun. • Electric lamp. • Kerosene (oil) lamp.	
2 **Sound** energy	As the energy produced from :	• Loudspeakers. • Musical instruments.	
3 **Electric** energy	As the energy produced from :	• Wind generator. • Solar cell.	
4 **Heat** energy	As the energy produced from :	• Heater (uses wood, coal or oil). • Gas cooker (oven).	
5 **Nuclear** energy	As the energy produced from :	• The reactions in the nucleus of an atom (nuclear reactors).	
6 **Chemical** energy	As the energy stored in :	• Food. • Car battery. • Fuel.	
7 **Mechanical** energy (potential energy + kinetic energy)	As the energy stored in :	• Stretched spring. • Waterfalls.	

Now, we will study potential energy, kinetic energy and mechanical energy as forms of energy :

FIRST Potential energy

When pulling a string of an arc (change its position), the work done to pull this string is stored in it in the form of potential energy.

Potential energy

It is the energy stored in the object due to the work done on it.

What is meant by ...?

The potential energy of an object = 30 joule.

➲ This means that the energy stored in the object due to work done on it is 30 joule.

Factors affecting the potential energy :

1. Weight of the object.
2. Height of the object from the ground.

1 Weight of the object

Activity 1 • **To show the effect of the weight of the object on its potential energy :**

Steps :

1. Bring four identical spheres and let them be on the ground.
2. Lift one sphere from the ground up to a table level.
3. Lift two spheres (together) up to the same level of the table.
4. Repeat the previous step by lifting up three spheres, then four spheres.

Observation :

The work (effort) done to lift spheres up increases by increasing the number of lifted spheres (the weight).

Conclusion :

The potential energy stored in an object increases by increasing its weight.

Weight «Newton» = **Mass** «kg» × **Acceleration due to gravity** «m/sec²»

NB The value of the acceleration due to gravity = $9.8 \simeq 10$ m/sec²

G.R. ***The weight of an object is different from its mass.***

Because object's weight = Object's mass × Acceleration due to gravity.

2 Height of the object from the ground

Activity (2) • To show the effect of the height of the object from the ground on its potential energy :

Steps :

1. Bring a basin filled with sand and a somewhat heavy sphere.
2. Raise the sphere a half metre height and let it fall in the basin.
3. Repeat the previous step several times by increasing the height of the sphere and returning the sand graded every time.



Observation :

By increasing the height of the sphere upwards, the work done increases, therefore the print that the sphere makes in the sand increases by increasing its height from the ground.

Conclusion :

The potential energy increases by increasing the height at which the object reaches.

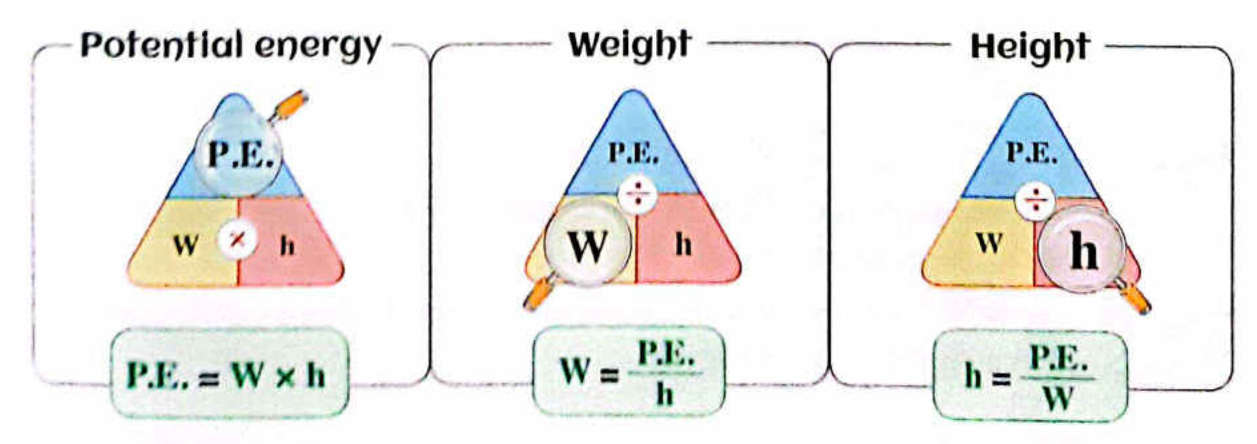
i.e.

Potential energy of an object is directly proportional to its weight and height from the ground.

• From activities (1) & (2), the potential energy of a body can be calculated from the relation :

Potential energy (P.E.) = Weight (W) × Height (h)
«Joule» «Newton» «Metre»

To calculate the Potential energy, Weight and Height :





∵ Work = Force × Displacement

∴ When the work is stored in a form of potential energy notice that :

- Force $\xrightarrow{\text{is indicated by}}$ the weight.
- Displacement $\xrightarrow{\text{is indicated by}}$ the height from the Earth's surface.

What is meant by ...?

The potential energy of an object = zero.

➲ This means that the object is placed on the ground.

G.R. ***No change in the potential energy when the object moves horizontally.***
Because its height does not change as the potential energy is directly proportional to the height of the object from the ground.

Problems

1 ***An object, whose mass is 2.5 kg. and it is at a height of 4 m., calculate its potential energy. If its height is decreased by 1 m., calculate its new potential energy.***

(Acceleration due to gravity = 10 m/se

Solution

∵ Weight = Mass × Acceleration due to gravity = 2.5 × 10 = 25 N.

∴ P. E. at a height of 4 m. = Weight × Height = 25 × 4 = 100 joule

When the height decreases by 1 m., the new height will be 3 m.

∴ New potential energy = 25 × 3 = 75 joule

2 ***Find the weight of an object of potential energy 88 joule when it is found at a height 11m.***

Solution

$$\text{Weight} = \frac{\text{Potential energy}}{\text{Height}} = \frac{88}{11} = 8\ \text{N.}$$

Question

1. An object, whose mass is 2 kg. and it is at a height of 5 m. from the Earth's surface. ***Calculate*** the potential energy.
2. ***Calculate*** the height of an object from the Earth's surface. Knowing that its weight is 4 N and its potential energy is 10 joule.

What happens to the potential energy in the following cases ?

Numerical application

Potential energy = Weight × Height

1 **If the weight of an object increases to double «height is constant».**

The potential energy increases to double.

In the first case	In the second case
$W_1 = 20$ N	$W_2 = 40$ N
increases to double	
$h_1 = 5$ m	$h_2 = 5$ m
$(P.E.)_1 = 20 \times 5$	$(P.E.)_2 = 40 \times 5$
= 100 joule	= 200 joule
increases to double	

2 **If the height of an object from Earth's surface decreases to half «weight is constant».**

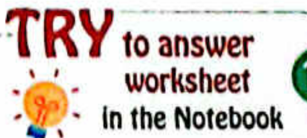
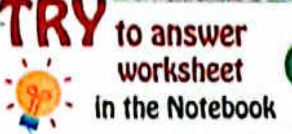
The potential energy decreases to half.

In the first case	In the second case
$W_1 = 20$ N	$W_2 = 20$ N
$h_1 = 5$ m	$h_2 = 2.5$ m
decreases to half	
$(P.E.)_1 = 20 \times 5$	$(P.E.)_2 = 20 \times 2.5$
= 100 joule	= 50 joule
decreases to half	

3 **If the weight of an object increases to double and its height from Earth's surface decreases to half.**

The potential energy of the object is still constant.

In the first case	In the second case
$W_1 = 20$ N	$W_2 = 40$ N
increases to double	
$h_1 = 5$ m	$h_2 = 2.5$ m
decreases to half	
$(P.E.)_1 = 20 \times 5$	$(P.E.)_2 = 40 \times 2.5$
= 100 joule	= 100 joule
still constant	

SECOND Kinetic energy

When a stretched string is left, so the work stored in this string is released in the form of kinetic energy.

Kinetic energy

It is the work done during the motion of an object.

What is meant by ...?

The kinetic energy of an object = 40 joule.

➲ This means that the work done during the motion of the object is 40 joule.



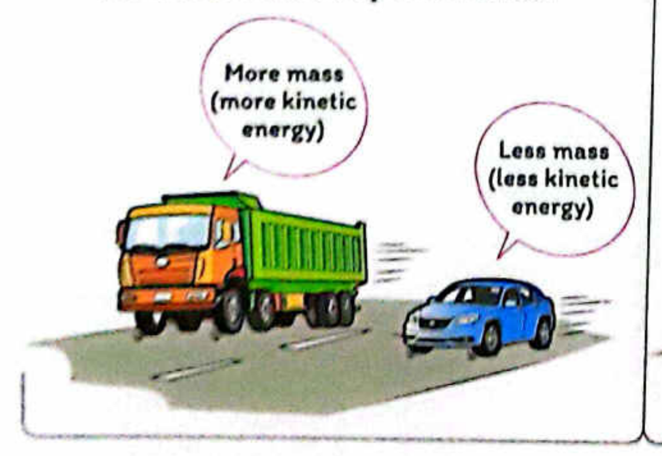
Factors affecting the kinetic energy :

1. Mass of the object.
2. Speed of the object.

1. Mass of the object

- If two cars, one has a mass larger than the other, are moving at the same speed.
- **So, the work done needed to stop the car of larger mass is more than that needed to stop the car of smaller mass G.R.**

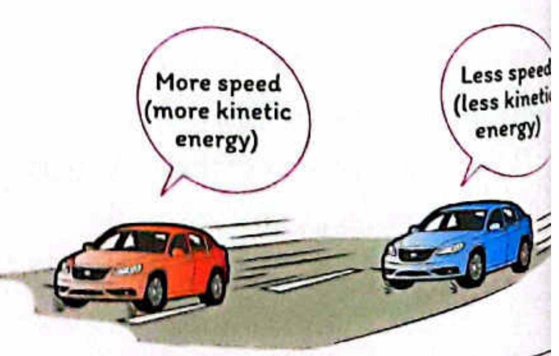
Because the kinetic energy of a moving object increases by increasing the mass of the object. So, the work done to stop it increases.



2. Speed of the object

- If two cars of identical mass and one car is moving faster than the other.
- **So, the work done needed to stop the faster car is more than that needed to stop the car of lower speed G.R.**

Because the kinetic energy of a moving object increases by increasing the speed of the object. So, the work done to stop it increases.



So, the kinetic energy of a moving body can be calculated from the relation :

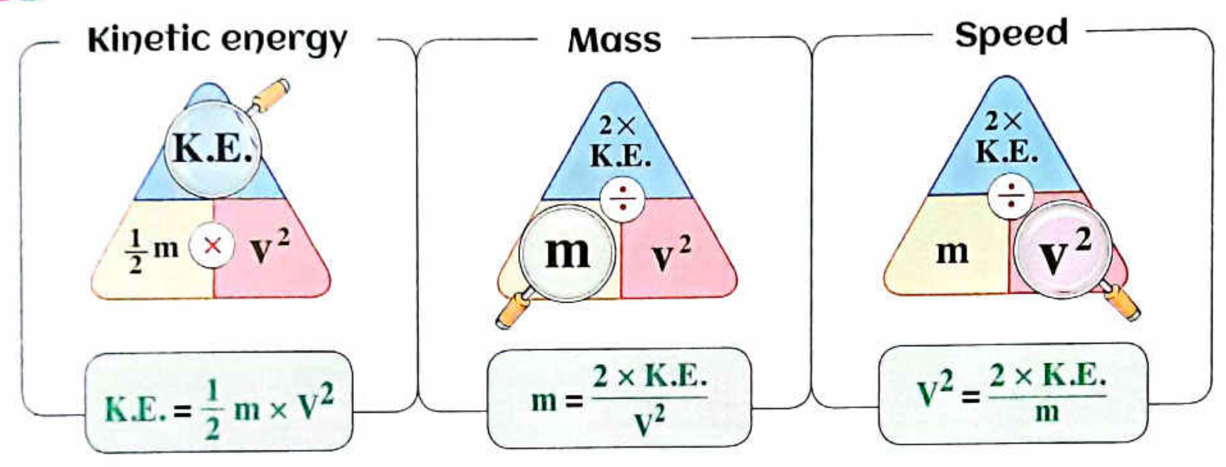
Kinetic energy (K.E.) = $\frac{1}{2}$ × Mass (m) × $(\text{Speed})^2$ $(V)^2$
«Joule» «kg» «$(\text{m/sec.})^2$»

NB The measuring unit of speed (V) is m/sec.

i.e.

Kinetic energy of a moving body is directly proportional to its mass and square of its speed of motion.

To calculate the Kinetic energy, Mass and Speed :



$K.E. = \frac{1}{2} m \times V^2$ $m = \frac{2 \times K.E.}{V^2}$ $V^2 = \frac{2 \times K.E.}{m}$

What is meant by ...?

Kinetic energy of an object equals zero.

➲ This means that the object is at rest (speed = zero).

Problems

1 ***A racing bike is moving at a speed of 20 m/s., calculate its kinetic energy knowing that the mass of the bike is 8 kg.***

Solution

Kinetic energy = $\frac{1}{2}$ × Mass × $(\text{Speed})^2$

Kinetic energy = $\frac{1}{2} \times 8 \times (20)^2 = 1600$ joule

2 ***Calculate the mass of an object, its kinetic energy equals 50 joule and its speed equals 5 m/sec.***

Solution

$\text{Mass} = \frac{2 \times K.E.}{(\text{Speed})^2} = \frac{2 \times 50}{5 \times 5} = 4 \text{ kg.}$

Question

1. An object, whose mass is 5 kg. and moves at a speed of 10 m/sec. ***Calculate*** its kinetic energy.
2. ***Calculate*** the speed of an object, its mass is 10 kg. and its kinetic energy is 500 joule.

What happens to the kinetic energy in the following cases ?

Numerical application

$$\text{Kinetic energy} = \frac{1}{2} \times \text{mass} \times (\text{speed})^2$$

1 If the mass of a moving object decreases to half «speed is constant».

The kinetic energy decreases to half.

In the first case	In the second case
$M_1 = 5$ kg.	$M_2 = 2.5$ kg.
decreases to half	
$V_1 = 10$ m/sec.	$V_2 = 10$ m/sec.
$(K.E.)_1 = \frac{1}{2} \times 5 \times (10)^2 = 250$ joule	$(K.E.)_2 = \frac{1}{2} \times 2.5 \times (10)^2 = 125$ joule
decreases to half	

2 If the speed of a moving object increases to double «mass is constant».

The kinetic energy increases to four times.

In the first case	In the second case
$M_1 = 5$ kg.	$M_2 = 5$ kg.
$V_1 = 10$ m/sec.	$V_2 = 20$ m/sec.
increases to double	
$(K.E.)_1 = \frac{1}{2} \times 5 \times (10)^2 = 250$ joule	$(K.E.)_2 = \frac{1}{2} \times 5 \times (20)^2 = 1000$ joule
increases to four times	

3 If the mass of a moving object decreases to half and its speed increases to double.

The kinetic energy increases to double.

In the first case	In the second case
$M_1 = 5$ kg.	$M_2 = 2.5$ kg.
decreases to half	
$V_1 = 10$ m/sec.	$V_2 = 20$ m/sec.
increases to double	
$(K.E.)_1 = \frac{1}{2} \times 5 \times (10)^2 = 250$ joule	$(K.E.)_2 = \frac{1}{2} \times 2.5 \times (20)^2 = 500$ joule
increases to double	

4 **If the mass of a moving object decreases to quarter and its speed increases to double.**

The kinetic energy is still constant.

$M_1 = 5$ kg.	$M_2 = 1.25$ kg.
decreases to quarter	
$V_1 = 10$ m/sec.	$V_2 = 20$ m/sec.
increases to double	
$(K.E.)_1 = \frac{1}{2} \times 5 \times (10)^2$ = 250 joule	$(K.E.)_2 = \frac{1}{2} \times 1.25 \times (20)^2$ = 250 joule
still constant	

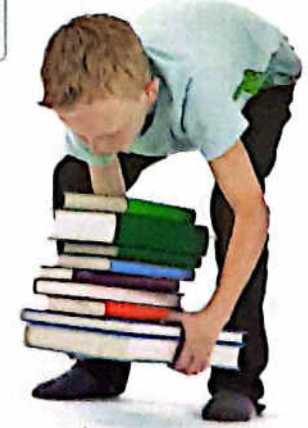
Comparison between potential energy and kinetic energy of an object :

	Potential energy	Kinetic energy
Definition	It is the energy stored in the object due to the work done on it.	It is the work done during the motion of an object.
Factors affecting it	• Weight of the object. • Height of the object from the ground.	• Mass of the object. • Speed of the object.
Law used	Potential energy = Weight × Height.	Kinetic energy = $\frac{1}{2}$ × Mass × (Speed)^2.

THIRD Mechanical energy

- When you **lift** an object, you do work that is stored in the object in the form of **potential energy**.





- When the object **falls down**, the stored potential energy is changed gradually into **kinetic energy**.
- The sum of potential and kinetic energies of an object is known as **mechanical energy**.

Mechanical energy

It is the sum of potential and kinetic energies of the object.

Mechanical energy = Potential energy + Kinetic energy



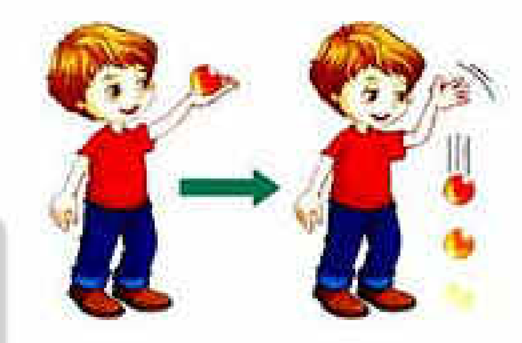


To show the conversion of potenial energy into kinetic energy and vice versa :



Steps :

1. Raise a tennis ball up to your head level.
2. Let it fall down.





Observation :

The ball moves continuously up and down after hitting the ground.

Explanation :

- On raising the ball, the work done by the hand is stored in the ball as a **potential energy**.
- When the ball is left to reach the ground, the **potential energy** is converted into **kinetic energy**.
- When the ball returns to rise, the **kinetic energy** is converted into **potential energy**.



Conclusion :

Potential energy is converted into kinetic energy and vice versa.

From the previous explanation, we find that when the object falls down :

- **The height decreases** $\xrightarrow{\text{So, its}}$ **potential energy decreases.**
  (height from the Earth's surface)

- **Its speed increases** $\xrightarrow{\text{So, its}}$ **kinetic energy increases.**

* **This means that,** the potential energy is converted gradually into kinetic energy "and vice versa when lifting up the body", so at any moment, the sum of potential and kinetic energies of an object equals a constant value known as the "Mechanical energy".

Application of mechanical energy

- The following figure shows falling an object from a high place and the values of potential, kinetic and mechanical energies of this object :

Decreasing the potential energy and increasing the kinetic energy

	Potential energy	+	Kinetic energy	=	Mechanical energy
	800 joules		zero		800 joules
	600 j		200 j		800 j
	400 j		400 j		800 j
	200 j		600 j		800 j
Earth's surface	zero		800 j		800 j

At maximum height :
- The potential energy is maximum.
- The kinetic energy equals zero.

So, the mechanical energy = the potential energy

At the mid point :
- The potential energy = The kinetic energy = $\frac{1}{2}$ mechanical energy.

So, the mechanical energy = 2 × potential energy

Or = 2 × kinetic energy

On reaching the object to the ground :
- The potential energy equals zero.
- The kinetic energy is maximum.

So, the mechanical energy = the kinetic energy



NB

At any point :

The work done = The mechanical energy of an object = Potential energy + Kinetic energy.

GR.

Although the decrease in the potential energy of an object during falling, but its mechanical energy remains constant.

Because the decrease occurs in the potential energy of an object during falling equals the increase in its kinetic energy.

Problems

1 ***Calculate the mechanical energy of a moving body, whose potential energy is 200[0] joule and its kinetic energy is 100 joule.***

Solution

The mechanical energy = Potential energy + Kinetic energy

= 2000 + 100 = 2100 joule

2 ***A stone, whose mass is 3 kg., is thrown from a height of 10 m. Find its potential energy and its kinetic energy :*** ***(Acceleration due to gravity = 10 m/se[c²])***

(a) At the beginning of fall.

(b) When it reaches the middle of the height.

(c) After reaching at a height of 3 m.

(d) When it reaches the Earth.

Solution

Potential energy of the stone	Kinetic energy of the stone
(a) At the beginning of fall	
• Weight = Mass × Acceleration due to gravity = 3 × 10 = 30 N. Pot. energy = Weight × Height = 30 × 10 = 300 joule	• Kinetic energy = zero
(b) When it reaches the middle of the height	
• The middle of the height = $\frac{10}{2}$ = 5 m. Pot. energy = 30 × 5 = 150 joule	∵ At the middle of the height : Pot. energy = Kinetic energy ∴ Kinetic energy = 150 joule

Potential energy of the stone | **Kinetic energy of the stone**

(c) After reaching at a height of 3 m.

- Pot. energy = Weight × Height
  = 30 × 3 = 90 joule

- Mechanical energy = Pot. energy at the maximum height = 300 joule
  Kinetic energy =
  Mechanical energy − Potential energy
  = 300 − 90 = 210 joule

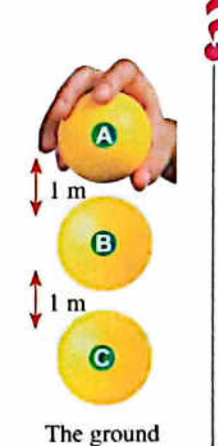
(d) When it reaches the Earth

- Pot. energy = zero

- Kinetic energy = Mechanical energy
  = 300 joule

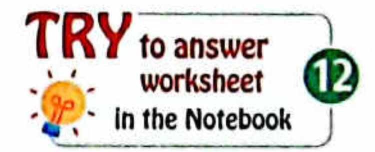
Question

1. The opposite figure represents the falling of a ball, whose weight is 5 N. from the position (A) to the position (C) passing through (B).
   Calculate :
   (1) The kinetic energy at position (A).
   (2) The potential energy at position (B).



2. A person throws a ball, whose mass 0.5 kg. vertically upwards, and while it was passing through point (X) which is 4 m above the Earth's surface, its speed was 3 m/sec. ***Calculate*** the work done on the ball at point (X).

(Acceleration due to gravity = 10 m/sec.^{2})



Remember Lesson One



Energy :

- It is the ability to do work or to make a change.
- Its measuring unit is **Joule.**

Resources of energy :

- The Sun.
- Wind.
- Movement of water.
- Nuclear reactions.
- Food.
- Fuel.

Forms of energy :

- Mechanical energy.
- Light energy.
- Sound energy.
- Electric energy.
- Chemical energy.
- Heat energy.
- Nuclear energy.

Potential energy :

- It is the energy stored in the object due to the work done on it.

Factors affecting the potential energy :

- Weight of the object.
- Height of the object from the ground.

Weight = Mass × Acceleration due to gravity.

The value of acceleration due to gravity = 9.8 ≃ 10 m/sec^2.

P.E. = Weight × Height

Potential energy of an object is directly proportional to its weight and height from the ground.

Kinetic energy :

- It is the work done during the motion of an object.

Factors affecting the kinetic energy :

- Mass of the object.
- Speed of the object.

$$\text{Kinetic energy} = \frac{1}{2} \times \text{Mass} \times (\text{Speed})^2$$

Kinetic energy of a moving object is directly proportional to its mass and square of its speed of motion.

The mechanical energy :

- It is the sum of potential and kinetic energies of the object.

$$\text{Mechanical energy} = \text{Potential energy} + \text{Kinetic energy}$$

Questions  on lesson One

● Remember ● Understand ● Apply ● Higher skills 📖 School book questions.

Interactive Exercises

1. Choose the correct answer :

1. Who does work from the following cases ? ....
   a. A person pushes a wall.
   b. A person plays football.
   c. A person sleeps.
   d. A person studies, while he is sitting.

2. A force of 10 newton affects a body to move it a distance 5 m., so the work done is .... joule.
   a. 5
   b. 30
   c. 50
   d. 150

3. If the force decreases by half and the displacement is doubled, so the work ....
   a. is doubled.
   b. decreases to half.
   c. doesn't change.
   d. increases to four times.

4. If a man acts on a car by a force equals 50 N. and the car doesn't move a distance, so the work done by the man equals ....
   a. zero.
   b. 50 J.
   c. 100 J.
   d. 1000 J.

5. Food and fuel are sources of .... energy.
   a. chemical
   b. mechanical
   c. electric
   d. sound

6. 📖 Resource of permanent energy is ....
   a. petrol.
   b. the Sun.
   c. nuclear reaction.
   d. coal.

7. .... is an example of the sources of electric energy.
   a. Electric fan
   b. Oil lamp
   c. Oven
   d. Solar cell

8. .... is from the clean sources of energy which doesn't pollute the environment.
   a. Petrol
   b. Coal
   c. Wood
   d. Wind

9. 📖 Chemical energy can be stored in ....
   a. car battery.
   b. stretched spring.
   c. raising a load upwards.
   d. car lamps.

10. Weight of the body on the Earth equals its ....
    a. mass + gravity acceleration.
    b. mass × gravity acceleration.
    c. mass ÷ gravity acceleration.
    d. mass – gravity acceleration.

11. Potential energy equals ....

a. weight × height.
b. mass × height.
c. weight × speed.
d. mass × weight.

12. The potential energy of an object at the mountain top is .... the potential energy of the same object at the ground.

a. more than
b. equal to
c. less than
d. half

13. As doubling height to which an object is raised from ground, so the ....

a. kinetic energy is increased to its double value.
b. potential energy is increased to 3 times.
c. potential energy is increased to double value.
d. mechanical energy is increased to 4 times.

14. An object of 20 N. weight is placed at 5 m. height, it has a potential energy of ....

a. 50 J.
b. 150 J.
c. 100 J.
d. 200 J.

15. An object of mass 2 kg. is moving at a speed of 4 m/s. has a kinetic energy of ....

a. 16 J.
b. 64 J.
c. 32 J.
d. 128 J.

16. When the speed of a moving object is doubled, its kinetic energy ....

a. will not change.
b. will be four times its value.
c. will be doubled.
d. will be three times its value.

17. Kinetic energy = ...

a. $\frac{1}{2}$ Mass × (Height)^2.
b. $\frac{1}{2}$ Height × (Speed)^2.
c. $\frac{1}{2}$ Mass × (Speed)^2.
d. $\frac{1}{2}$ Weight × (Speed)^2.

18. As an object falls downwards ....

a. the potential energy increases gradually.
b. the kinetic energy increases gradually.
c. the mechanical energy is lost.
d. the speed of the object decreases gradually.

19. At the maximum height that the object reaches, ... is vanished.

a. potential energy
b. kinetic energy
c. mechanical energy
d. light energy

• 20. [ ] As an object is launched upwards, ... gradually.

a. its speed decreases
b. its speed increases
c. its kinetic energy increases
d. its potential energy decreases

• 21. [ ] Mechanical energy is the sum of .... energies.

a. potential and heat
b. light and kinetic
c. potential and kinetic
d. potential and light

• 22. In the opposite figure :

(A) The maximum value of the potential energy is at position ....

a. ❶ b. ❷ c. ❸ d. ❹

(B) The maximum value of the kinetic energy is at position ....

a. ❶ b. ❷ c. ❸ d. ❹

(C) The mechanical energy is equal to ....

a. kinetic energy at ❶ + potential energy at ❷
b. kinetic energy at ❶ + potential energy at ❹
c. kinetic energy at ❷ + potential energy at ❷
d. kinetic energy at ❹ + potential energy at ❷

• 23. If the potential energy of an object which is at maximum height is 100 joule, so its mechanical and kinetic energies equals .... respectively.

The choice :	a	b	c	d
Mechanical energy (J)	0	100	50	50
Kinetic energy (J)	100	0	50	0

• 24. When the kinetic energy of an object decreases by 40 joule and its potential energy increases by 40 joule, so the mechanical energy ....

a. will increase by 80 joule.
b. will decrease by 40 joule.
c. will not change.
d. will increase by 40 joule.

• 25. When an object falls from a high place, its mechanical energy at any point before reaching the ground equals its ....

a. kinetic energy.
b. potential energy.
c. kinetic energy + potential energy.
d. kinetic energy – potential energy.

2. Choose from column (B) what suits it in column (A) :

• 1

(A)	(B)
1. Wind generator	a. is a source of nuclear energy.
2. Radio cassette	b. is a source of heat energy.
3. Electric lamp	c. is a source of electric energy.
4. Oven	d. is a source of sound energy.
	e. is a source of light energy.

• 2

(A)	(B)
1. Mechanical energy	a. Force × Displacement.
2. Kinetic energy	b. Mass of object × Acceleration due to gravity.
3. Potential energy	c. Potential energy + Kinetic energy.
4. Work	d. Weight of object × Height.
5. Weight	e. $\frac{1}{2}$ Mass × $(\text{Speed})^2$.
	f. Mass of object × Height.

• 3

(A)	(B)
1. Energy	a. m/sec^2.
2. Mass	b. Second.
3. Weight	c. Kilogram.
4. Height	d. Metre.
5. Speed	e. Joule.
6. Acceleration due to gravity	f. m/sec.
	g. Newton.

3. Put (✓) or (×) in front of each of the following statements and correct the wrong one :

- 1. Speed is the ability to do work or to make a change. ( )
- 2. A bar of chocolate has no energy. ( )
- 3. Chemical energy can be produced from oil heater. ( )
- 4. Height of the object = Object's mass × Earth's gravity acceleration. ( )
- 5. Potential energy of an object decreases by increasing its height. ( )
- 6. Potential energy = Height + Weight. ( )
- 7. The potential energy of two identical objects at 5 m. height are similar values. ( )
- 8. The kinetic energy of a static object equals zero. ( )
- 9. The kinetic energy of an object is directly proportional to its mass and the square of its speed. ( )

10. Kinetic energy = Mass × $(Speed)^2$. ( )

11. The kinetic energy of a small car is greater than that of a bus (moving at the same speed). ( )

12. Work done = Potential energy × Kinetic energy. ( )

13. By raising a ball from the ground, its potential energy decreases. ( )

14. When a stone falls down, its kinetic energy increases. ( )

15. As the mass of a moving object increases, the work done to stop it increases. ( )

16. The potential energy of an object at the maximum height is equal to its kinetic energy at the moment it reaches the ground. ( )

17. At the mid point between the maximum height and the ground of a falling object its potential energy is less than its kinetic energy at the same point. ( )

4. Write the scientific term of each of the following :

1. The ability to do work or to make a change.
2. The measuring unit of energy.
3. The product of multiplying the force by the displacement.
4. The energy stored in an object due to the work done on it.
5. The product of multiplying the weight of an object by its height from the ground.
6. The work done during the motion of an object.
7. The sum of the potential and kinetic energies of an object.

5. Complete the following statements :

1. .... is the ability to do work and its measuring unit is ....
2. Joule = ... × metre
3. If a man affects on a car by a force 50 N and the car doesn't move from its place, so the work done on it equals ....
4. .... , ... and heat energies are from forms of energy.
5. We obtain .... energy from electric lamps and .... energy from oven.
6. The energy stored in food is .... energy, while that is produced from the solar cell is .... energy.
7. Potential energy increases by increasing the .... of the body and its .... from the ground.
8. Weight of an object = ... × ....

9. Mass is determined by .... unit, while the weight is determined by .... unit.
10. Potential energy = ... × ....
11. Kinetic energy increases by increasing .... and .... of the object.
12. Kinetic energy = $\frac{1}{2}$ × .... × ....
13. When a truck and a small car move at the same speed, kinetic energy of the truck is .... than that of the car.
14. If the speed of a moved object is doubled, its kinetic energy increases ....
15. When a ball falls down, ... energy changes to .... energy gradually.
16. Mechanical energy = ... + ...
17. At maximum height, the mechanical energy of an object equals its .... energy only, while on reaching the object at the ground, its mechanical energy equals its .... energy only.
18. When a body is raised up, the potential energy .... , while the kinetic energy ....
19. If the potential energy of an object is 100 joule and its kinetic energy is 50 joule, its mechanical energy is ....

6. Complete the following tables :

(1)

Device	Energy produced
Electric heater	..................(1)..................
Electric fan	..................(2)..................
Solar cell	..................(3)..................
Electric lamp	..................(4)..................
..................(5)..................	Sound energy

(2) If an object of (weight 20 N. and mass 2 kg.) was thrown upwards, complete the following table : (Acceleration due to gravity = 10 m/sec^2)

Height (m.)	Speed (m/s.)	Potential energy (J)	Kinetic energy (J)
0	10	0	100
3.75	.......(1).......	.......(2).......	25
.......(3).......	0	.......(4).......	.......(5).......

7. Give reasons for :

1. Fuel in a car is as food for a man.
2. Some countries try to use the wind energy and solar energy as resources of energy.
3. The person who pushes a car forward consumes energy.

4. The weight of an object is different from its mass.
5. Potential energy of an object increases by increasing its weight.
6. When an object falls from up to down, its potential energy decreases gradually.
7. The potential energy of a falling object at the moment of its reaching the Earth's surface equals zero.
8. When the moving object stops, its kinetic energy becomes zero.
9. The work done to stop a moving car increases by increasing the speed of the car.
10. The kinetic energy of an object increases when it falls, although its mass is constant.
11. The kinetic energy of a moving object increases by the increase of its mass.
12. At the maximum height of a projectile, its mechanical energy is equal to its potential energy only.
13. Although the decrease in the value of potential energy of an object during its falling, its mechanical energy still constant.
14. The value of the kinetic energy of an object could not be more than its mechanical energy.

8. Define :

1. Energy.
2. Potential energy.
3. Kinetic energy.
4. Mechanical energy.

9. What is meant by ... ?

1. Potential energy of an object is 20 joule.
2. The potential energy of an object = zero.
3. The weight of an object = 500 newton.
4. An object, its potential energy is 80 joule at a height of 10 m.
5. The energy stored in the object due to the work done on it = 100 joule.
6. Kinetic energy of an object is 20 joule.
7. The kinetic energy of an object = zero.
8. Mechanical energy of an object is 100 joule.

10. What is the mathematical relationship that binds between each of the following ?

1. Work and force.
2. Weight of an object and its mass.
3. Potential energy of an object and its height from the Earth's surface.
4. Kinetic energy of an object and its mass.
5. Kinetic energy of an object and its speed.

6. The mass of a moving object and its speed.
7. Mechanical energy of an object and its potential energy.

11. Which of the following cases exerts work ? Why ?

1. Someone raises an object from the ground.
2. Someone pushes an object along road.
3. A boy carries a book and stands.

12. What's the energy stored in the following cases ?

1. A piece of bread.
2. Stretched spring.
3. Waterfalls.
4. Raising a load upwards.
5. Car battery.

13. What happens when ... ?

1. A person doesn't eat food for a long time.
2. Decreasing the force to half and increasing the displacement to double. (concerning the work done).
3. Doubling the weight of an object and its height from the ground is constant (concerning its potential energy).
4. Doubling the speed of a moving object and its mass is constant (concerning its kinetic energy).
5. Falling an object from a high position (concerning its mass).
6. Increasing the height of an object from the Earth's surface to double and decreasing its mass to half (concerning its potential energy).
7. Doubling the mass of a moving object and its speed is constant (concerning its kinetic energy).
8. Increasing the speed of an object to double and its mass decreases to half (concerning its kinetic energy).
9. Lifting a ball upwards (concerning the work done on it).
10. Falling an object towards the Earth's surface (concerning its potential and kinetic energies).

14. Problems :

1. A force of 20 newton is acted on a body to move it to a distance of 1.5 metres in the direction of the force. Calculate the work done.

2. Calculate the displacement of an object when a force of 25 N is acted on it and the work done to move it is 500 joule.

3. If the work done to move a box to a distance of 2 metres equals 40 joule. Calculate the force.

4. A stone of 2 kg. mass falls from 2 metres height. Calculate its potential energy at this height (knowing that the gravity acceleration = 10 m/s^2)

5. Adel puts his box of magazines on the top of his cupboard. Calculate the potential energy of the box if its weight is 100 N. and the height of the cupboard is 2 m.

6. Calculate the weight of an object, whose mass is 5 kg. if you know that the acceleration due to gravity is 9.8 m/s^2.

7. Find the weight of an object of potential energy 88 joule when it is found at a height 11 m.

8. Find the potential energy of an object, whose mass is 5 kg. when it is found at a height of 10 m. from the ground and calculate the potential energy of the object when its weight is doubled and the height is decreased to its half value.

(considering gravity acceleration = 10 m/s^2)

9. If a ball thrown vertically to reach 20 m. height and its weight is 5 newton. Calculate its potential energy at :

(a) The highest point. (b) The ground.

10. Calculate :

(a) The potential energy of an object, whose weight is 10 N. and placed at 5 m. height from the ground.

(b) The kinetic energy of an object, whose mass is 2 kg. and moving at a speed of 5 m/s.

11. Calculate the mass of a billiard ball of a speed 30 m/sec., if you know that its kinetic energy equals the kinetic energy of a basketball of a mass 7.5 kg. and moving by a speed of 6 m/sec.

12. Which of the following objects has the largest potential energy ?

(a) An object (A), whose mass is 7 kg. and at a height of 6 m.

(b) An object (B), whose weight is 50 N. and at a height of 10 m.

(knowing that the acceleration due to gravity = 10 m/sec^2)

13. A football player kicked a ball of 0.85 kg. to move at a speed of 20 m/s., calculate its kinetic energy and calculate the kinetic energy of the ball when its speed is doubled.

14. An object has a kinetic energy 64 joule and is moving at a velocity 4 m/s. Find the object mass.

15. Calculate the speed of a moving body, whose mass is 80 kg. and its kinetic energy is 1000 joule.

16. A stone of 5 kg. mass falls from 8 m. height, what is its potential energy ? And what is its kinetic energy ? In each of the following :
(consider gravity acceleration = 10 m/s^2.)
(a) At the start of falling.
(b) At height 2m.
(c) On reaching ground.

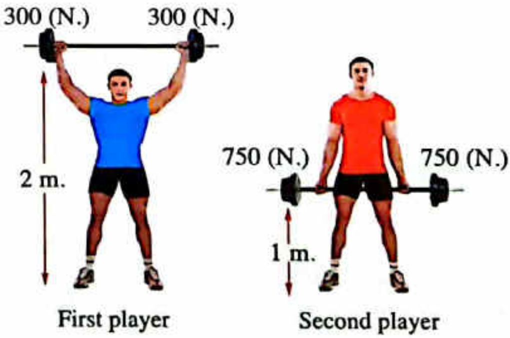
17. Calculate the mechanical energy of a moving object if its kinetic energy is 1000 joule and its potential energy is 500 joule.

18. Someone kicked a ball of mass 0.5 kg. and weight 5 N. vertically upwards. At a height of 4 m, its speed was 10 m/s. Calculate :
(a) The potential energy at 4 metres height.
(b) The work done on the ball at this height.
(c) The maximum height that the ball reached.

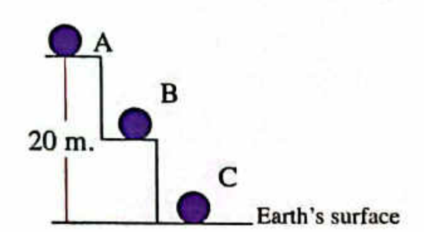
19. If a person throws a ball, whose mass is 8 kg. it reaches a maximum height of 12 m. Calculate the kinetic energy for this ball when returning to 7 m. height.

(Acceleration due to gravity = 10 m/sec^2)

20. From the opposite figures, which of the two players does work to raise more weights ? Prove this mathematically.



21. Look at the opposite figure and answer :
(a) At which point the potential energy of the ball = zero.
(b) Find the potential energy of the ball at (Point A).
(Knowing that the weight of the ball is 10 N.).

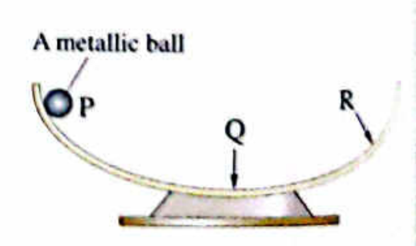


15. Variant questions :

- (1) Mention four forms of energy, then mention the sources of these energies.
- (2) Compare between potential and kinetic energies of an object.
- (3) Mention the factors that affect the potential energy and write the relation between them.
- (4) Mention the factors that affect the kinetic energy and write the relation between them.
- (5) The developed countries aim to use solar energy, wind and water motion more than before ... Explain.
- (6) A person stood on the edge of a cliff and threw a ball in his hands upwards (as shown in the opposite figure).
  - In any positions, the kinetic energy of the ball is maximum and its potential energy is minimum ? ....

The choices	(A)	(B)	(C)	(D)
The maximum kinetic energy is at position	(1)	(2)	(3)	(3)
The minimum potential energy is at position	(2)	(3)	(1)	(3)

- (7) In the opposite figure : When a ball moves from position P, it lands and rises to position R, then it reverses the direction of its movement and after several seconds, the movement stops, which of the following choices is correct ? ....



The choices	Potential energy		Kinetic energy	
	P ⟶ Q	Q ⟶ R	P ⟶ Q	Q ⟶ R
(A)	decreases	increases	increases	increases
(B)	decreases	increases	increases	decreases
(C)	decreases	decreases	increases	increases
(D)	increases	decreases	decreases	increases



Thinking Skills Questions

1. **Calculate** the height, where a body of a mass 25 kg. falls, knowing that the speed of the body at the moment of colliding with the Earth's surface is 20 m/sec.

(Acceleration due to gravity = 10 m/sec^2).

2. **Calculate** the potential energy of a copper ball, its volume is 100 cm^3 and its density is 8.8 gm/cm^3 when it raises upwards at a height of 10 m. above Earth's surface.

(Acceleration due to gravity = 10 m/sec^2)

3. **In the opposite figure,** if you know that the sum of potential and kinetic energies of a body its mass is 5 kg. at point (B) is 900 joule.

Calculate its kinetic energy at point (A).

(Acceleration due to gravity = 10 m/sec^2)

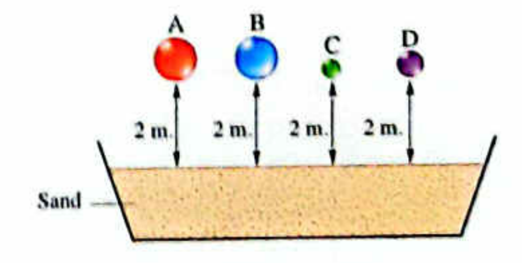
B
A
15 m.
Earth's surface

4. In front of you, there are two balls of iron at a height of 2 metres from Earth's surface.

Which of the two balls stores more potential energy ? And why ?

Y
X
2 m.
2 m.
Earth's surface

5. **In the opposite figure,** if you throw four solid balls of different materials from the same height in a bath filled with sand and the depths that occurred by the balls when dropped in the sand are recorded in the table below the figure :



Answer the following questions :

Ball	A	B	C	D
The depth of the print in sand :	12 cm.	5 cm.	8 cm.	12 cm.

1. Which of these balls :

(a) stores less energy ?

(b) have the same mass ?

2. Which ball (A) or (D), the density of its matter is more ? Give a reason .

3. **Put (✔) or (✘) :**

(a) The depth of the print occurred by the ball in the sand increases by increasing its volume. ( )

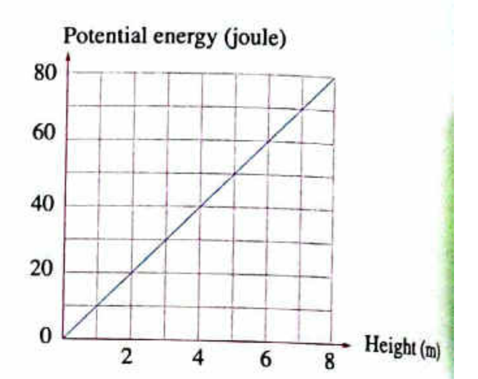
(b) The density of matter of ball (B) is less than the density of any matter from the matter of other balls. ( )

6. The opposite graph represents the relation between the height of an object from the Earth's surface and its potential energy. **Answer the following :**

(a) What is the value of potential energy when the object is at a height of 5 m.?

(b) What is the decrease of the potential energy when the object falls from a height of 7 m. to 3 m. ?

(c) Calculate the weight of that object.



7. Choose the correct answer :

1. The fig. .... represents the relation between the potential energy (P.E.) of an object and its height (h) from the ground.

(P.E.) 0 h — a.　(P.E.) 0 h — b.　(P.E.) 0 h — c.　(P.E.) 0 h — d.

2. The fig. .... represents the relation between the kinetic energy (K.E.) of an object and the square of its speed $(V)^2$.

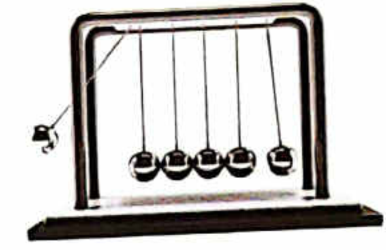
(K.E.) 0 V^2 — a.　(K.E.) 0 V^2 — b.　(K.E.) 0 V^2 — c.　(K.E.) 0 V^2 — d.

LESSON 2

Energy Transformations



What is meant by conservation of mechanical energy ?



To understand the concept of conservation of mechanical energy, carry out the two following activities.



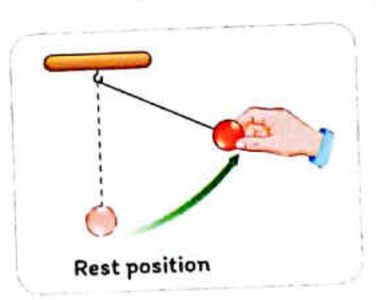

Activity (1)

- **To prove the conservation of mechanical energy of a body during its movement :**



Step :

Pull a simple pendulum away from its rest position to a higher position, then leave it.





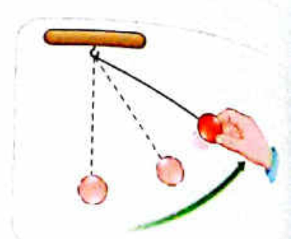
Observation :

- The pendulum moves on both sides around its rest position, where **the speed** of the vibrating pendulum :
  - **decreases** as it goes away from its rest position.
  - **is maximum** when it passes its rest position during its movement.

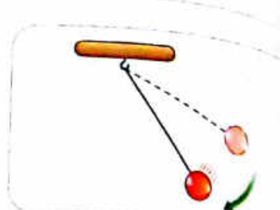




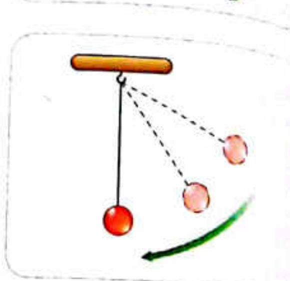
Explanation :



1 Pulling the pendulum to a higher position means that there is a work done which is stored in the pendulum in the form of **potential energy**.

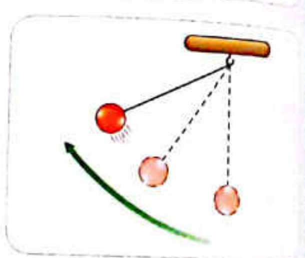


2 When you leave the pendulum, the **potential energy** changes gradually into **kinetic energy**.



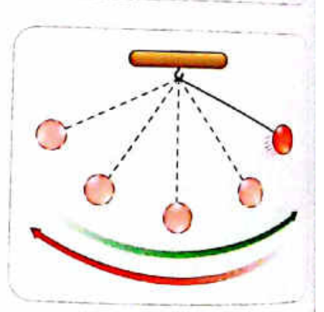
3 When the pendulum passes its rest position, its speed is **maximum**, so :

- Kinetic energy is **the maximum**.
- Potential energy is **the minimum**.
- **Mechanical energy = Potential energy + Kinetic energy.**



4 When the pendulum reaches the maximum height, its speed is **zero**, so :

- Kinetic energy is **zero**.
- Potential energy is **the maximum**.
- **Mechanical energy = Potential energy.**



5 The pendulum keeps moving right and left around its rest position, keeping its mechanical energy value constant **G.R.**

Due to the exchange between the potential and kinetic energies as the mechanical energy = P.E. + K.E.



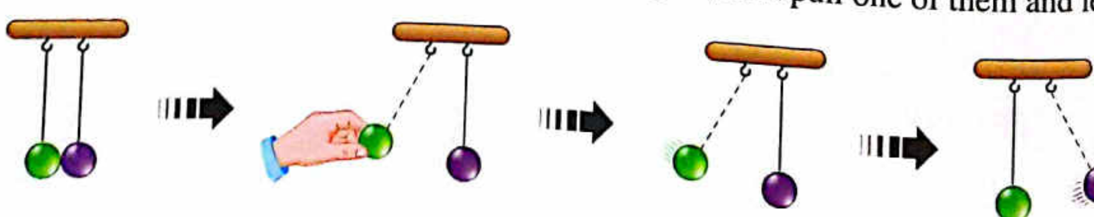
Activity 2 • **To prove the conservation of mechanical energy of two bodies before and after their collision :**





Step :

Bring two similar pendulums as shown in the figure, then pull one of them and leave it.



Observation :

When the moving pendulum strikes the pendulum that at rest, the rest one moves and the moving one stops.

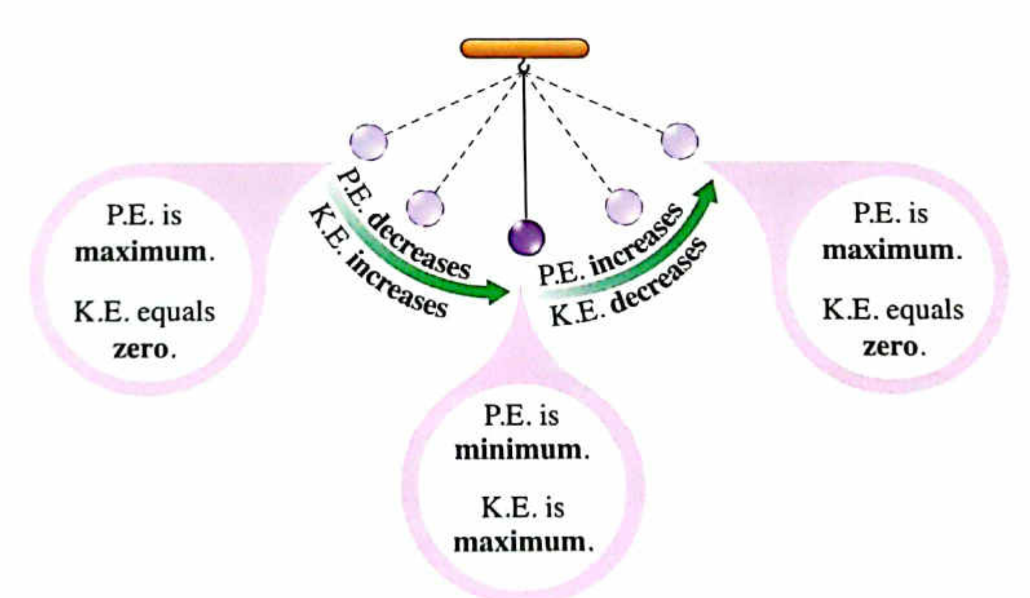
Explanation :

During the collision the potential and kinetic energies are exchanged between the two pendulums, where each of them keeps its mechanical energy value constant.

From the previous two activities , We can conclude that :

The moving body keeps its mechanical energy constant (which alternates between potential energy and kinetic energy), where the decrease in potential energy equals the increase in kinetic energy at any moment and vice versa.

(Where, the air resistance is negligible)



G.R. ***The motion of the children's swing is like that of the pendulum.***

Because in both of them, the potential energy and kinetic energy are interchanged without ending and the sum of such energies (the mechanical energy) at any moment is constant.

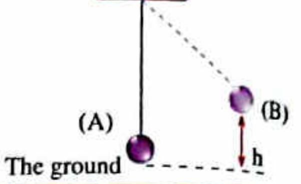






Problem

A moving pendulum has a potential energy of 0.8 joule at maximum displacement (B). If the mass of the pendulum is 0.16 kg. and acceleration due to gravity is 10 m/s^2. Calculate :



a. The height (h) of the pendulum at maximum displacement.

b. The kinetic energy of the pendulum at point (B).

Solution

a. Object weight = object mass × acceleration due to gravity

$$= 0.16 \times 10 = 1.6 \text{ newton}$$

The potential energy at the maximum displacement = weight × height

$$0.8 = 1.6 \times \text{height}$$

Height (maximum displacement) = $\frac{0.8}{1.6} = 0.5$ m.

b. The kinetic energy of the pendulum at the maximum displacement (B) is zero.

Question

Problems :

1. A moving pendulum, its mechanical energy equals 20 joule.
   Calculate its potential energy and its kinetic energy at the highest point.
2. A moving pendulum, the mass of its ball is 0.4 kg., its mechanical energy is 8 joule and its kinetic energy during passing through rest position is 5 joule.

Calculate :

(1) The potential energy of the pendulum at rest position.

(2) The kinetic energy of the pendulum at maximum point.

(3) The speed of the pendulum at the moment of its passing through rest position.

Complete :

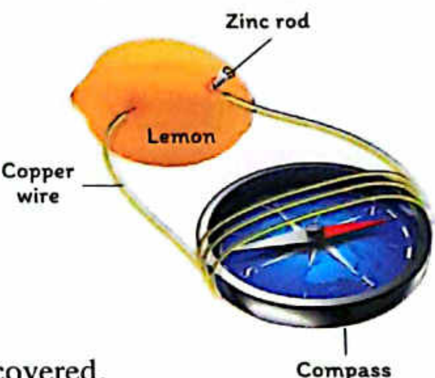
1. When the pendulum goes away from its rest position to reach the maximum height, the .... energy is the maximum and .... energy is zero.
2. When the pendulum reaches the maximum height, kinetic energy equals .... and potential energy equals the .... energy.

Transformations of energy and technological applications

1 Transformations of energy in the simple electric cell

In the simple electric cell, the **chemical energy** changes into **electric energy**.

Activity (3) • To make a model of the simple electric cell :



Tools :

- A large lemon.
- A small compass.
- A copper wire.
- A zinc rod.



Steps :

1. Press the lemon to soften it and to increase its juice, then dip the zinc rod in it.
2. Make the two terminals (ends) of the copper wire uncovered, then coil the wire around the compass several times.
3. Dip one of the uncovered terminals of the wire into the lemon and tie the other terminal around the zinc rod.



Observation :

The needle of the compass deflects.

Explanation :

Some chemical reactions occur inside the lemon producing an electric current passes in the wire that is indicated by the deflection of the compass needle.

Conclusion :

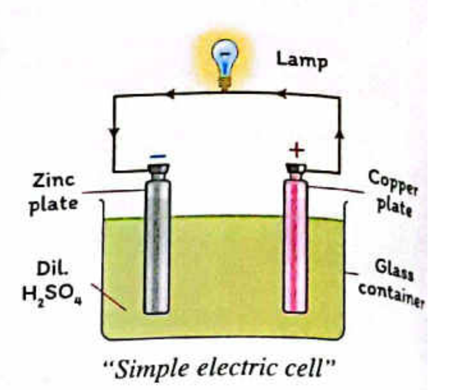
The **chemical energy** stored in the lemon is converted into **electric energy** as in the simple electric cell.

What happens if ...?

A potato is used instead of the lemon in the previous activity.

➲ The needle of the compass will deflect, where the salt solution in the potato has the same effect of acidic solution in the lemon.

The simple electric cell :



"Simple electric cell"

⊙ Its idea of operation :

It converts the chemical energy into electric energy.

⊙ Its construction :

It consists of :

a. A glass container containing dilute sulphuric acid (H_2SO_4).

b. Two metal plates are immersed (dipped) in the diluted sulphuric acid and connected to each other, one of them is ***copper*** (positive pole) and the other is ***zinc*** (negative pole).

⊙ The direction of the passage of the electric current in the wire :

The electric current passes from positive copper plate (+) to negative zinc plate (–).

G.R. ***Immersing two copper plates in diluted sulphuric acid is not considered a simple electric cell.***

Because the simple electric cell must have two different metal plates immersed in diluted sulphuric acid.

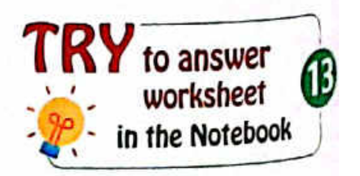
Question

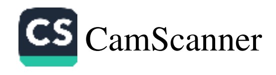
Complete :

1. In the simple pendulum, ... energy and .... energy are exchanged.
2. In the simple electric cell, ... energy converts into .... energy.
3. In the simple electric cell, ... is the positive pole, while .... is the negative pole.

What happens when ... ?

Dipping two different metals connected by a wire in an acidic solution.





2 Transformations of energy in the electric lamp

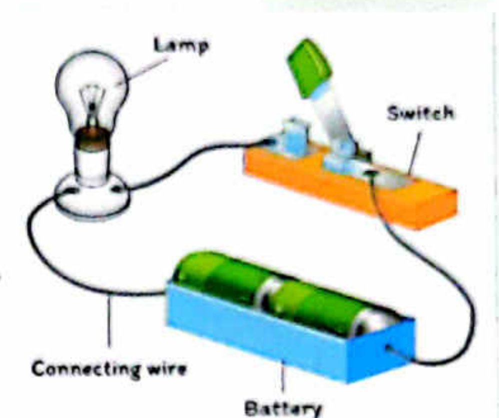
In the electric lamp, the **electric energy** changes into **light energy** and **heat energy**.

Activity (4) • **To show the changes of energy in the electric lamp :**



Tools :

- A battery (dry electric cell).
- An electric lamp.
- Connecting wires.
- A switch.





Steps :

1. Connect the electric circuit (as shown in the figure).
2. Close the switch of the circuit for one minute, then open it again.
3. Touch the glass of the lamp with your hand after asking your teacher.

Observation :

The lamp lights and becomes hot on closing the switch.



Warning:

Take care of touching the electric lamps in your house on lightening G.R.

Because they are very hot.

Explanation :

Passing the electric current in the filament of the electric lamp makes it hot and glows up.

Conclusions :

- The electric current flows through the **closed** electric circuit.
- In the electric lamp, the **electric energy** changes into **light energy** and **heat energy**.



Exercise

Use the items shown in the figures in front of you to set a tool to alert :

(1) A deaf person (cannot hear). ***(2) A blind person (cannot see).***

Switch	Battery	Connecting wires	Electric lamp	Electric bell

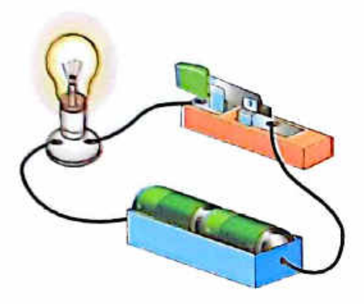
Answer

1. A tool for a deaf person :

Connect the electric circuit (as shown in the figure), then close the switch.

You observe that the **electric lamp lights**.

(The electric energy changes into light and heat energies).

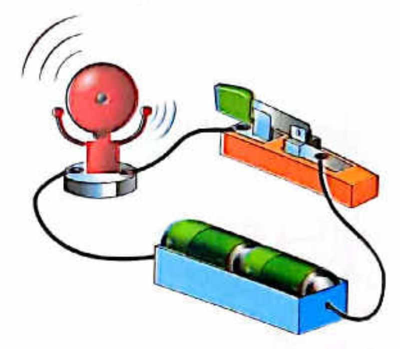


2. A tool for a blind person :

Connect the electric circuit (as shown in the figure) , then close the switch.

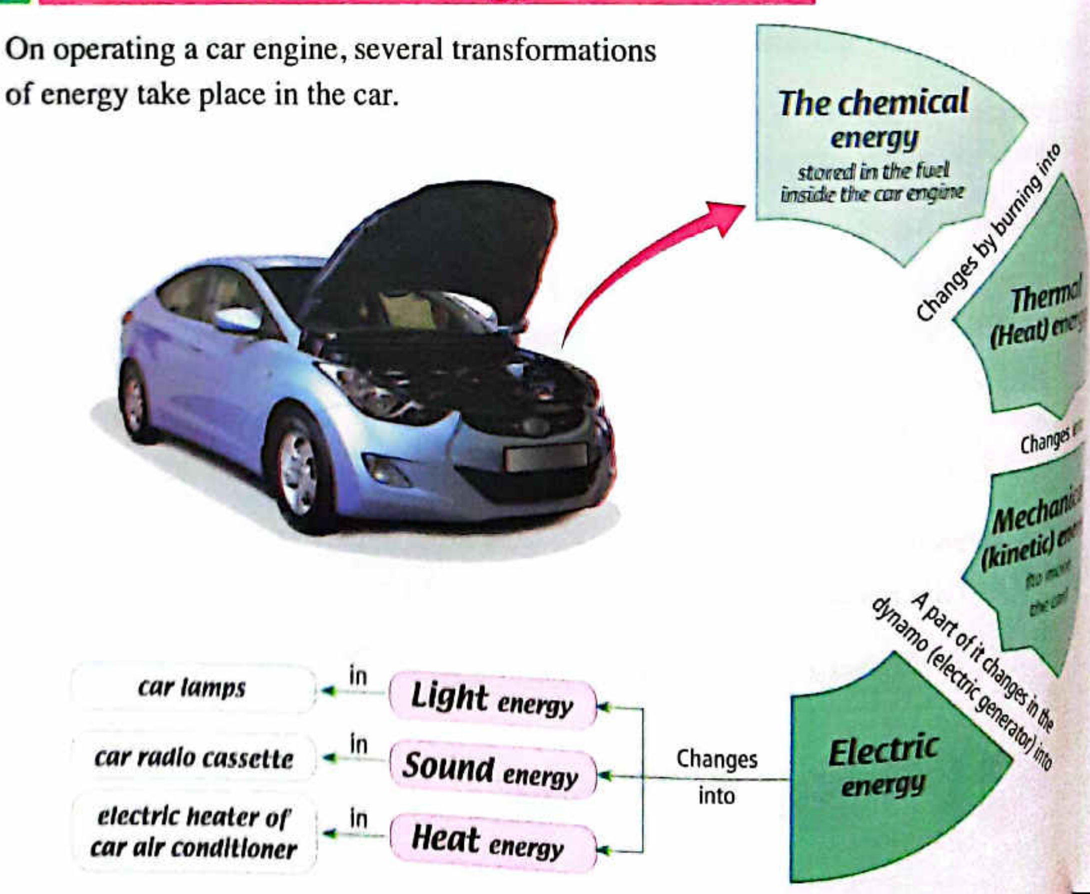
You observe that the **bell rings**.

(The electric energy changes into sound energy).



3 Transformations of energy inside the car

On operating a car engine, several transformations of energy take place in the car.



➲ From the previous transformations of energy, **we deduce the law of conservation of energy :**

The law of conservation of energy

Energy is neither created nor destroyed, but it is converted from one form to another.

➲ **Examples** *of some technological applications and the energy transformations found in them :*

Technological applications	Figures	Energy changes	
		From	Into
1 Sewing machine		Electric energy	Mechanical (Kinetic) energy
2 Solar cell		Solar energy (energy produced from the Sun)	Electric energy
3 Television		Electric energy	Light and sound energies
4 Cellular phone		Electric energy	Light and sound energies
5 Nuclear reactor		Nuclear energy	Electric energy

Question

Complete the following table :

The instrument	Energy used	Energy produced
1. Electric fan	....	....
2. Electric heater	....	....
3. Electric lamp	....	....
4. Washing machine	....	....
5. Electric bell	....	....

Complete :

1. The .... states that energy is neither created nor destroyed, but it is converted from one form to another.
2. In the nuclear reactor, the nuclear energy changes into .... energy.

Effects of technological applications on man and environment

1 Positive effects of technology :

- Using energy resources for many purposes.
- Changing energy from one form to another in some applications to be used in man's life.

2 Negative effects of technology :

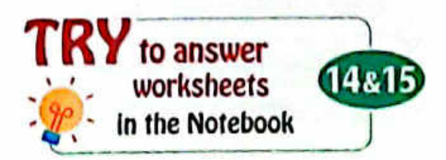
Some technological applications have negative effects. G.R.



* Because some of them cause environmental pollution as :
  - **(a)** electromagnetic pollution.
  - **(b)** noise pollution.
  - **(c)** chemical pollution of air, water and soil.
* In addition to there are some harms of technological applications when man uses them in :
  - **(a)** Wars and killing.
  - **(b)** Massive destruction.

Examples *of some technological applications and their negative effects :*

Technological applications	Negative effects	Figures
1 **Cars**	Their exhausts cause chemical pollution of air.	
2 **Military explosions**	They leave harmful effects, diseases and cause death.	
3 **Chemical pesticides**	- They cause chemical pollution of soil, water and air. - They cause cancer and food poisoning.	
4 **Nuclear weapons**	They cause massive destruction.	
5 **The networks of wireless transmitters of cellular phones**	They cause electromagnetic pollution.	
6 **Loudspeakers and drilling machines**	They cause noise pollution.	



Remember Lesson Two



The law of conservation of energy :

Energy is neither created nor destroyed, but it is converted from one form to another.

Changing of energy in some technological applications :

Technological applications	Energy changes	
	From	Into
• Solar cell :	Solar energy	Electric energy
• Nuclear reactor :	Nuclear energy	Electric energy
• Sewing machine : • Electric fan : • Washing machine :	Electric energy	Kinetic energy
• Electric heater :	Electric energy	Heat energy
• Electric bell :	Electric energy	Sound energy
• Electric lamp :	Electric energy	Light & heat energies
• Cellular phone : • Television :	Electric energy	Light & sound energies

Energy transformations inside the car :

Car constituents (technological applications)	Energy transformations
• Car engine :	- The chemical energy stored in the fuel changes by burning into thermal (heat) energy. - Heat energy changes into mechanical energy (to move the car).
• Car dynamo :	- A part of mechanical energy (kinetic energy) changes into electric energy.
• Car lamps :	- A part of electric energy changes into light and heat energies.
• Car radio cassette :	- A part of electric energy changes into sound energy.
• Electric heater of car air conditioner :	- A part of electric energy changes into heat energy.

Positive effects of technology :

. Using energy resources for many purposes.

. Changing energy from one form to another in some applications to be used in man's life.

Negative effects of technology :

* **Environmental pollution as :**

  - Electromagnetic pollution.
  - Noise pollution.
  - Chemical pollution of air, water and soil.

* **There are some harms of technological applications when man uses them in :**

  - Wars and killing.
  - Massive destruction.

Some technological applications and their negative effects :

Technological applications	Negative effects
1. Cars :	Their exhausts cause chemical pollution of air.
2. Military explosions :	They leave harmful effects, diseases and cause death.
3. Chemical pesticides :	- They cause chemical pollution of soil, water and air. - They cause cancer and food poisoning.
4. Nuclear weapons :	They cause massive destruction.
5. The networks of wireless transmitters of cellular phones :	They cause electromagnetic pollution.
6. Loudspeakers & drilling machines :	They cause noise pollution.

Questions  on lesson Two



● Remember ● Understand ● Apply ● Higher skills 📖 School book questions.

1. Choose the correct answer :

1. The mechanical energy of the pendulum at the highest point equals ....
   a. kinetic energy only.
   b. kinetic energy × potential energy.
   c. potential energy only.
   d. kinetic energy + potential energy.

2. 📖 In home when the gas stove is working, there is a change from ....
   a. heat energy into a chemical one.
   b. chemical energy into a heat one.
   c. chemical energy into a sound one.
   d. light energy into a heat one.

3. When you do work to displace a pendulum away from its rest position, this work is stored in the ball as a ....
   a. thermal energy. b. potential energy. c. kinetic energy. d. chemical energy.

4. 📖 In the simple pendulum, there is an energy transformation from ....
   a. mechanical energy into a sound one.
   b. mechanical energy into a light one.
   c. potential energy into a kinetic one and vice versa.
   d. kinetic energy into a heat one.

5. The changes of energy in the pendulum are similar to those occur in ....
   a. electric lamp. b. dynamo. c. electric bell. d. children's swing.

6. 📖 Energy is neither created nor destroyed but it can be transformed into another form, this law is known as law of ....
   a. conservation of energy.
   b. conservation of matter.
   c. kinetic energy.
   d. Earth's gravity.

7. 📖 In the filament of electric lamp, the ....
   a. electric energy is converted into mechanical energy.
   b. light energy is converted into heat energy.
   c. electric energy is converted into heat energy.
   d. chemical energy is converted into light energy.

8. Chemical energy ⟶ Heat energy ⟶ Mechanical energy.
   The sequence of energy changes shown in the diagram explains the ....
   a. flashlight is on.
   b. candle when burns.
   c. gasoline burns to power a car.
   d. photosynthesis process.

9. In the car engine, the chemical energy changes into .... energy.
   a. mechanical b. light c. electric d. heat

10. When car lamps and radio cassette are on, there is a change inside the car battery from ....
a. chemical energy into a light one.
b. chemical energy into a sound one.
c. chemical energy into an electric one.
d. electric energy into a light one.

11. The motor converts the electric energy into .... energy.
a. magnetic
b. chemical
c. light
d. kinetic

12. Electric energy is converted into kinetic energy in ....
a. electric lamp.
b. cellular phone.
c. electric fan.
d. electric bell.

13. In the solar cells, the solar energy (sunlight) is directly converted into .... energy.
a. kinetic
b. light
c. electric
d. sound

14. The role of technological applications is represented in ....
a. using energy resources and converting energy from a form to another.
b. creating energy from nothing.
c. storing energy as its form is.
d. illustrating energy forms.

2. Put (✓) or (x) in front of the following statements and correct the wrong ones :

1. The potential energy of the pendulum = its mechanical energy – its kinetic energy. ( )
2. When the pendulum reaches the maximum height, its potential energy is zero. ( )
3. The speed of the pendulum increases as it goes away from the rest position. ( )
4. The simple electric cell consists of a sugary solution and two similar metals are dipped in it. ( )
5. An electric current is produced when a copper plate and a zinc plate are dipped in a potato. ( )
6. In the electric cell, the electric energy is converted into chemical energy. ( )
7. In car lamps, electric energy changes into light energy. ( )
8. Kinetic energy changes into electric energy in the sewing machine. ( )
9. In the electric iron, the electric energy is converted into heat energy. ( )
10. Chemical pesticides cause electromagnetic pollution of air, water and soil. ( )
11. The networks of wireless transmitters of cellular phones cause electromagnetic pollution. ( )
12. In the nuclear reactor, nuclear energy changes into electric energy. ( )

3. Write the scientific term of each of the following :

1. Energy is neither created nor destroyed, but it is converted from one form to another.
2. • The device which can be used to convert the chemical energy into electric energy.
   • The device which is consisted of an acidic solution dipped in it two different metals connected by a wire.
3. The pollution produced from the networks of wireless transmitters of cellular phones.

4. Complete the following statements :

1. When you move the pendulum to the left, then release it, the .... energy changes into .... energy.
2. When the pendulum goes away from its rest position to reach the maximum height, the .... energy is the maximum and .... energy is zero.
3. When the pendulum reaches the maximum height, kinetic energy equals .... and potential energy equals the .... energy.
4. The simple electric cell consists of .... solution are dipped in it two different ....
5. The positive pole in the simple electric cell is .... , while the negative pole is ....
6. In the simple electric cell, the electric current passes through the wire from .... plate to .... plate.
7. In the electric heater, ... energy changes into .... energy.
8. In the sewing machine, ... energy changes into .... energy.
9. In the electric fan, ... energy changes into .... energy.
10. In the car engine, ... energy stored in the fuel changes into .... energy at first.
11. There are some harms of technological applications of energy transformations when man uses them in .... and ....
12. The networks of wireless transmitters of cellular phones cause .... pollution, while loudspeakers cause .... pollution.

5. Complete the following table :

The instrument	Energy used	Energy produced
1. Simple electric cell	....	....
2. Cellular phone	....	....
3. Radio cassette	....	....
4. Electric motor	....	....
5. Dynamo	....	....
6. Door bell	....	....
7. Solar cell	....	....

6. Give reasons for :

1. In the simple pendulum, the kinetic energy of the vibrating body is maximum when it passes its rest position during its movement.

2. When the pendulum reaches the maximum point, the kinetic energy equals zero.
3. When the pendulum reaches the maximum point, the potential energy equals the mechanical energy.
4. During motion, the moving object keeps its mechanical energy constant.
5. The motion of the children's swing is like that of the pendulum.
6. When two different metals connected with a compass are dipped in a lemon, the needle of the compass deflects.
7. An electric current is generated when copper wire and zinc rod are dipped inside a lemon after connecting them to an electric lamp.
8. Immersing two copper plates in diluted sulphuric acid is not considered a simple electric cell.
9. You should take care of touching the electric lamp in your house on lightening.
10. Using batteries in the electric circuits.
11. Presence of electric generator inside the car.
12. Some technological applications have negative effects.
13. Car exhausts are considered from the negative effects of technological applications.
14. You must rationalize using chemical pesticides.
15. Ecologists do not appreciate all the technological applications which are used in energy transformations.

7. State the energy transformations in each of the following :

1. Simple electric cell.
2. Electric iron.
3. Dynamo.
4. Simple pendulum.
5. Electric bell.
6. Motor.
7. Electric heater of car air conditioner.
8. Dry cell.
9. Electric lamp.
10. Friction between hands.

8. Mention the name of the device which is used in changing :

1. Electric energy into heat energy.
2. Potential energy into kinetic energy and vice versa.
3. Electric energy into sound energy.
4. Electric energy into light and heat energies.
5. Electric energy into kinetic energy.
6. Solar energy into electric energy.
7. Nuclear energy into electric energy.
8. Heat energy into kinetic energy.



9. What happens when ... ?

1. You pull a simple pendulum away from its rest position to a higher position, then leave it.
2. The simple pendulum passes its rest position (concerning kinetic and potential energies).
3. The moving pendulum strikes the rest one.
4. The simple pendulum reaches the maximum height during its movement (concerning kinetic and potential energies).
5. Dipping two different metals connected by a wire in an acidic solution.
6. Coil a wire connected with two metals of the simple electric cell around a compass.
7. Burning fuel inside the car engine.
8. Overuse of chemical pesticides.
9. Construction of the networks of wireless transmitters of cellular phones near the buildings.

10. Problems :

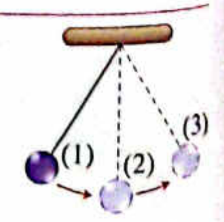
1. A moving pendulum has mechanical energy of 40 joule. Calculate its kinetic energy and potential energy at the highest point.

2. A moving pendulum has a potential energy of 0.8 joule at maximum displacement. If the mass of its ball is 0.08 kg. and acceleration due to gravity is 10 m/s^2. Calculate :
   (a) The height of the pendulum at maximum displacement.
   (b) The kinetic energy of the pendulum at such point.

3. A moving pendulum, its mass is 5 kg., its mechanical energy is 200 joule and its potential energy at the rest position is 50 joule.
   Calculate :
   (a) The height of the pendulum at the rest position from the Earth's surface.
   (b) The potential energy of the pendulum at maximum height.
   (acceleration due to gravity is 10 m/s^2)

4. The opposite figure shows the movement of a pendulum, its mass is 1 kg. and its kinetic energy during passing through the rest position is 8 joule.
   Calculate :
   (a) Its mechanical energy at the highest point.
   (b) Its speed at the moment of passing through the rest position.
   (acceleration due to gravity is 10 m/s^2)

5. In the shown figure, if the mechanical energy of the pendulum is 40 joule.
   Calculate its potential and kinetic energies at point (1).



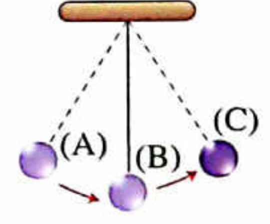
11. Variant questions :

- (1) **What is meant by the law of conservation of energy ?**
- (2) **Energy is neither created nor destroyed but it is converted from one form to another by using many technological applications.**
  Explain this statement through car engine.
- (3) **Show by drawing the structure of the simple electric cell.**
  Showing the direction of the passage of the electric current.
- (4) **How can you explain the efforts of some countries to share in some organizations which are concerned with the environment protection ?**
  Do you think that we need such organizations ?
- (5) **Name five of the technological applications which convert an energy form to another, then mention what the energy transformation in each application is.**
- (6) **Illustrate some technological applications in our life, then mention their negative effects.**

12. Study the following figures, then answer the following questions :

- (1) **From the opposite figure and by using these words [Zero – Maximum – Minimum] complete the following table :**

Position	Kinetic energy	Potential energy
A	....	....
B	....	....
C	....	....



- (2) **From the opposite figure, answer the following questions :**

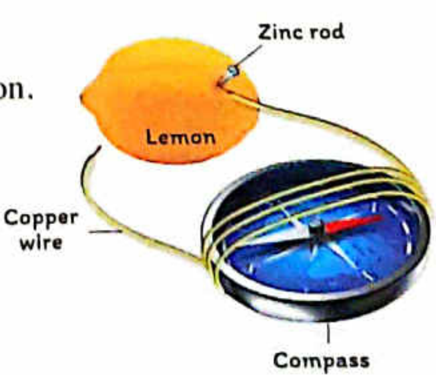
a. What happens when ...?

① Dipping the terminal of a copper wire in the lemon. (Giving the reason).

② Replacing the zinc rod with copper rod.

③ Replacing the lemon with a potato.

b. .... energy changes into .... energy in the lemon.



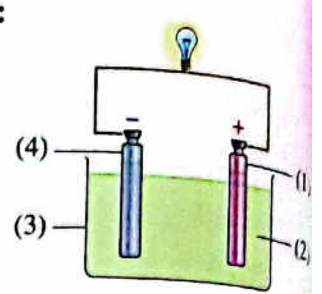
(3) **From the opposite figure, answer the following questions :**

a. Mention the name of the opposite device.

b. Label the figure.

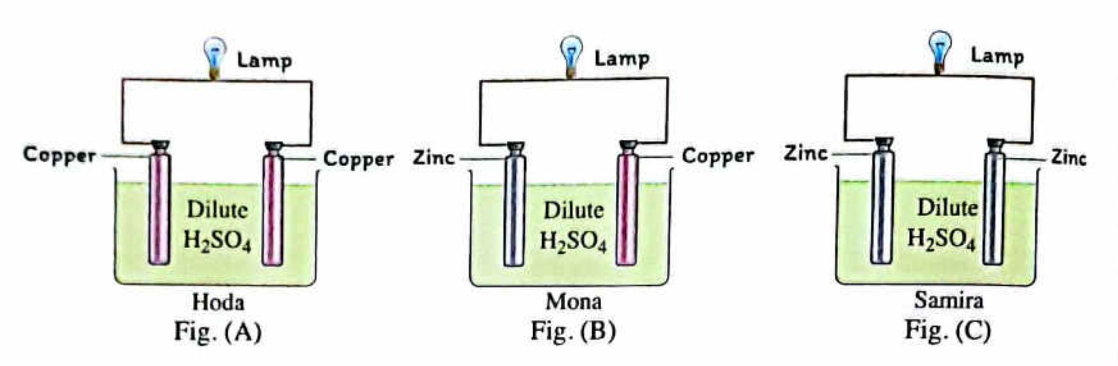
c. Mention the idea of its operation.

d. Mention the direction of the passage of the electric current in the wire.



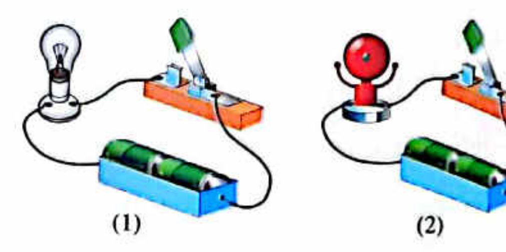
(4) **Hoda , Mona and Samira tried to make a model of the simple electric cell as in the following figures.**

(Choose the correct figure whose lamp becomes light).



Hoda Fig. (A) | Mona Fig. (B) | Samira Fig. (C)

(5) **From the opposite two circuits, answer the following questions :**



(1) (2)

a. What are the energy transformations that happen on closing the key in the two circuits ?

b. What do you feel when touching the electric lamp after closing the key for a while in the circuit (1) ?

c. Which of these two circuits is suitable for the attention of :

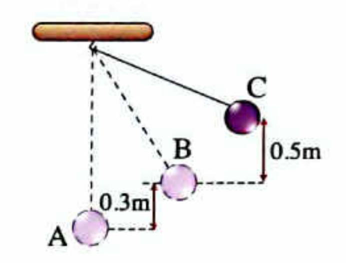
(1) A deaf person. (2) A blind person.



Thinking Skills Questions

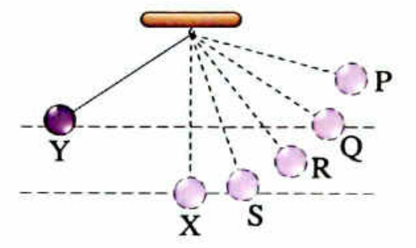
1. Look at the opposite figure, then :

Calculate the kinetic energy at point (B) if you know that the weight of the pendulum is 5 N.



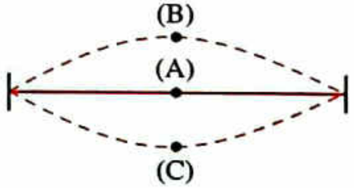
2. The opposite figure represents a ball hanged in a thread fixed in the ceiling of a room :

1. Can the ball reach the position (P) during its movement ?
2. When you leave the ball to move from position (Y). At what point from the following points (Q - R - S - X), the potential energy of the ball is maximum ? [Give a reason]



3. The opposite figure represents the movement of a string that was attracted to point (B), then left to reach the point (C) passing by point (A).

Answer the following questions :



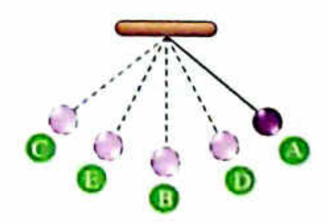
1. Show at what points (A, B or C), the value of potential and kinetic energies is maximum ?
2. Explain the conservation of mechanical energy for this string.

4. The opposite figure represents a ball hung in a thread and moves from Ⓐ to Ⓒ freely. Find the position(s) at which :

a. The kinetic energy = The potential energy.

b. The kinetic energy is maximum.

c. The potential energy is maximum.



LESSON 3

Heat Energy



How is heat energy transferred ?



Since the primitive man discovered fire, he always seeks to discover the nature of heat and how it is transferred.



How can we get heat energy ?

The following two activities show two ways of obtaining heat energy :



Activity 1 • To show that mechanical energy changes into heat energy by friction :

Steps :

1. Invert your bicycle as shown in the figure.
2. Let the pedal turns fast, then press the bicycle brakes strongly.
3. Touch the brakes and the frame of the wheel after it stops.



Observation :

You feel that the frame of the wheel and the brakes become hot due to friction between them that leads to increasing their temperatures.

Conclusion :

Mechanical energy is converted into heat energy by friction.

Life applications :



1



You feel warm when you rub your hands together in winter G.R.

Because the mechanical energy is converted into heat energy by friction.

2



Burning a match stick when it contacts with a rough surface G.R.

Because the mechanical energy is converted into heat energy by friction.

3



The nail gets hot when you pull it out from a thick wooden piece G.R.

Because the friction of the nail with the wooden piece during taking it off converts the mechanical energy into heat energy.



Activity 2 • To show that kinetic energy changes into heat energy :

Tools :

- Small identical metallic spheres.
- Plastic jar.
- Thermometer.

Steps :

1. Put the spheres in the plastic jar and record their temperature first by using thermometer.
2. Close the jar tightly.
3. Shake the jar rapidly from 20 to 30 times, then determine the spheres temperature again.





Observation :

The temperature of the spheres increases gradually after shaking.



Explanation :

Increasing the speed of spheres and their friction with each other during shaking leads to increasing their kinetic energy and therefore their temperature rises.

Conclusions :

- Kinetic energy changes into heat energy, because spheres movement and their friction with each other rise the temperature.
- The temperature is **directly proportional** to the speed of objects and therefore with their kinetic energy.

How is heat energy transferred ?

Activity  • To show how heat energy is transferred :

Tools:

- A plastic cup containing tap water.
- A metal piece (as a nut fastener) tied by a thread.
- A thermometer.
- A beaker containing boiling water.

Steps:

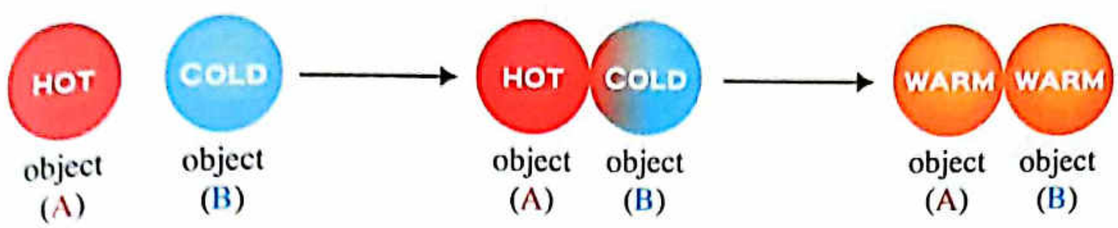
Steps:	1. Record the temperature of the tap water by using the thermometer.	2. Submerge the nut fastener in the boiling water by a thread for several minutes, until both of them become equal in temperature, then record this temperature.	3. Transfer the nut fastener from the boiling water to the tap water, then record their temperature together.
	Thermometer A cup containing tap water	Nut fastener Boiling water	
Expected temperature :	The recorded temperature is 20°C.	The recorded temperature is 100°C.	The recorded temperature is 25°C.

Observation :

The temperature of water on putting the hot nut fastener in it is more than the temperature of tap water and less than the temperature of boiling water.

Conclusion :

When touching two objects with different temperature, the heat is transferred from the object with **higher temperature** to another of **lower temperature**, then it stops when they are **equal in temperature**.



The heat transfers from higher temperature object (A) to lower temperature object (B), until they are equal in temperature

➲ **From the previous activity, we can define :**

Heat energy

It is a form of energy which is transferred from a higher temperature object to a lower temperature object.

Temperature

It is the heat condition which determines the direction of heat energy whether from or to the object when it comes in contact with another.

Question

Complete :

1. By increasing the particles movement, the temperature ....
2. Temperature is .... proportional to the .... energy of particles.
3. Friction turns .... energy into .... energy.

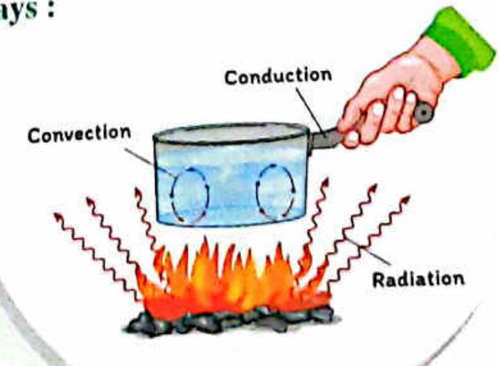
What happens when... ?

Two objects have the same temperature touches each other.

Ways of heat transfer

Heat transfers through different media in three ways :

1. The transfer of heat by **conduction** «through **some solid objects**».
2. The transfer of heat by **convection** «through **gases** and **liquids**».
3. The transfer of heat by **radiation** «through **material media** and **non-material ones (space)**».



1 The transfer of heat by conduction

Activity (4) • To show the transfer of heat by conduction :

Step :

Put a metallic spoon in a cup of hot tea, then touch the end of the spoon by your hand.

Observation :

You feel the hotness of the spoon.

Conclusion :

Heat transfers by conduction through some solid objects (metallic spoon) from one side to the other.

Transfer of heat by conduction

It is the transfer of heat through some solid objects from the part with higher temperature to that with lower temperature.

Life application :

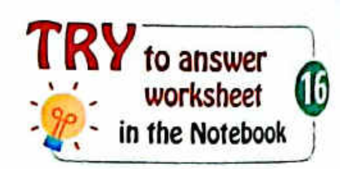
Cooking pans are made up of copper and aluminium G.R.

Because they are good conductors of heat and they have high melting points.



G.R. ***When you put a metallic spoon in a cup of hot tea for a time, you feel the hotness of the spoon.***

Because heat is transferred through solids by conduction.



2 The transfer of heat by convection

Transfer of heat by convection

It is the transfer of heat in gases and liquids, where hot molecules which have less density rise upwards, while colder molecules which have more density fall down.



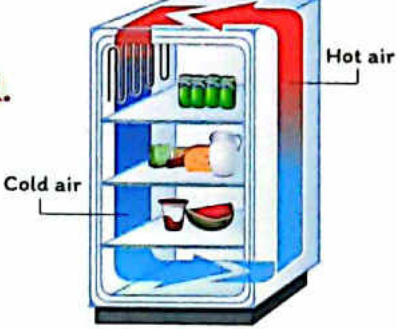
The transfer of heat by convection through liquids



Life applications :

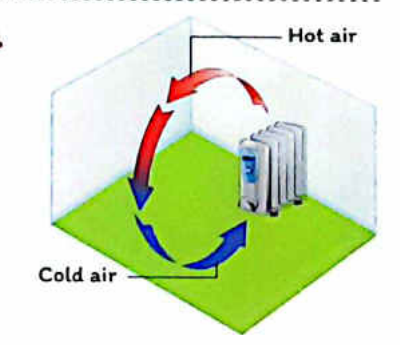
1 The freezer of the fridge is found at the top of the fridge G.R.

Because when air is cooled, its density increases, **so** it falls down to cool the food in the refrigerator, while the hot air (with low density) rises up to be cooled again and so on.



2 The electric heater is placed at the bottom of the room G.R.

Because when air (around the heater) is heated, its density decreases, **so** it rises up to warm the room, while the cold air (with high density) falls down to be heated again and so on.



3 The transfer of heat by radiation

The heat of the Sun is transferred to the Earth without any need for a material medium and this way is known as the **transfer of heat by radiation**.



Transfer of heat by radiation

It is the transfer of heat from a hot object to another without any need for a material medium through which heat transfers.

Life applications :



1	2
Wearing dark clothes in winter G.R.	**Wearing light colours clothes in summer G.R.**
To absorb most of the heat of the Sun rays.	To reflect most of the heat of the Sun rays.

G.R. ***The heat of the Sun doesn't reach the Earth by conduction or convection.***
Because there is a vast vacuum between the Sun and the Earth.

NB
- Heat is transferred by radiation through material media and non-material ones.
- Heat is transferred from the heater to our bodies by convection and radiation.
- Heat is transferred from all resources of light by convection and radiation, while heat is transferred from the Sun by radiation only.

Technological applications that produce heat

There are a lot of technological applications that produce heat, but they are different in:

1. The energy resources that they depend on.
2. The kind of energy resources.
3. The effect on the environment.

The following table shows some examples of technological applications which produce heat energy.

Technological application	The resource of energy depending on it	The kind of energy resource	The effect on the environment
Electric heater : **Electric water heater :** **Electric stove :**	Electricity	Renewable	Non-polluting
Solar heater : **Solar oven :**	The Sun	Permanent	Non-polluting
Gas or petrol stove :	Petroleum derivatives	Non-renewable	Polluting
Gas oven :	Natural gas	Non-renewable	Polluting
Coal heater :	Coal	Non-renewable	Polluting



Exercise

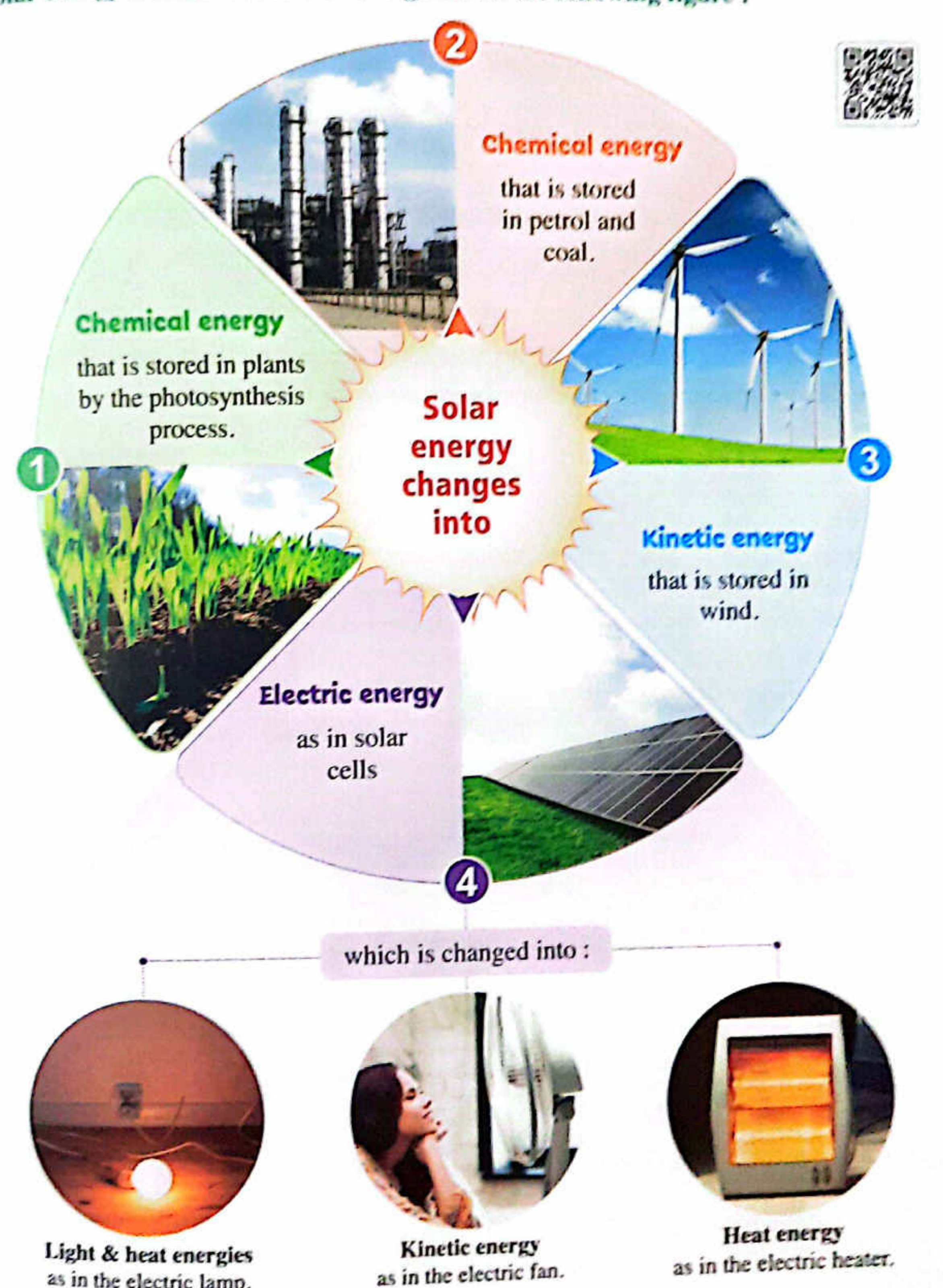
Mention some technological applications that depend on the solar energy and change it into other forms.

Answer

Technological applications		Energy transformations
• Solar cells	• Solar battery	Solar energy changes into electric energy.
• Solar heater • Solar furnace	• Solar oven	Solar energy changes into heat energy.

Solar energy (the Sun) is the origin of most energies

- Solar energy is considered the cleanest and cheapest source of energy **G.R.**
  Because it doesn't pollute the environment.
- Solar energy changes into other energies as in the following figure :





G.R.

- ***Importance of solar energy in our life.***
  Because it is the main source of most energies on the Earth's surface.

- ***The production of electricity from solar energy is preferred to that which is produced from burning of fuel.***
  Because solar energy is a clean source of energy, which doesn't pollute the environment and it is a permanent source of energy.

Question

Complete :

1. Heat is transferred by three methods which are .... , ... and ....
2. Heat is transferred through solids by .... , while through gases and liquids by ....
3. Heat is transferred through .... and .... by radiation.
4. The idea of making cooking pans from aluminium depends on the transfer of heat by .... , while the idea of putting the freezer at the top of the fridge depends on the transfer of heat by ....
5. In the solar battery, ... energy changes into .... energy.
6. The idea of making .... and .... depends on converting the solar energy into heat energy.

TRY to answer worksheet 17

- General Exercise of the School Book on Unit 2
- Model Exams on Unit 2

in the Notebook



Remember Lesson Three



Heat energy :

It is a form of energy which is transferred from a higher temperature object to a lower temperature object.

Temperature :

It is the heat condition which determines the direction of heat energy whether from or to the object when it comes in contact with another and it is directly proportional to the kinetic energy of the particles.

Ways of heat transfer

Heat transfers by conduction	Heat transfers by convection	Heat transfers by radiation
It is the transfer of heat through some solid objects from the part of higher temperature to the part of lower temperature.	It is the transfer of heat in gases and liquids, where hot molecules, which have less density rise upwards, while colder molecules which have more density fall down.	It is the transfer of heat from a hot object to another without any need for a material medium through which heat transfers.

Technological applications that produce heat energy

- Electric heater; Electric water heater
- Electric stove
- Solar heater; Solar oven
- Gas oven
- Gas or petrol stove
- Coal heater

Technological applications that depend on solar energy

- Solar cells
- Solar battery
- Solar heater
- Solar oven
- Solar furnace

Questions  on lesson Three



• Remember • Understand • Apply • Higher skills School book questions.

1. Choose the correct answer :

1. By increasing the kinetic energy of particles, their .... increase.
   a. weights b. temperatures c. volumes d. masses

2. Heat is transferred from cube (A) to cube (B), because it is ....
   a. larger in volume. b. greater in density.
   c. higher in temperature. d. lower in temperature.

(A) (B)
50°C 20°C

3. Heat is transferred through solids by ....
   a. conduction and convection. b. radiation only.
   c. radiation and convection. d. conduction only.

4. Heat is transferred through copper and iron by ....
   a. convection only. b. radiation only.
   c. conduction only. d. radiation and convection.

5. Heat is transferred by convection through ....
   a. gases only. b. liquids only. c. solids only. d. gases and liquids.

6. The freezer of the fridge is found at the top of the fridge, because the cold air ....
   a. falls down to be replaced by hot air. b. is a bad conductor of heat.
   c. is a good conductor of heat. d. is a bad conductor of electricity.

7. Heat transfers from a heater by ....
   a. conduction and radiation. b. radiation and convection.
   c. conduction and convection. d. radiation only.

8. If you sit down under a lighted electric lamp, heat is transferred to you by ....
   a. convection only. b. radiation only.
   c. conduction only. d. convection and radiation.

9. Heat transfer by radiation takes place through ....
   a. liquids only. b. gases only.
   c. material media and non-material ones. d. metals only.

10. Heat is transferred through space by ....
    a. convection only. b. conduction only.
    c. radiation only. d. conduction and convection.

11. The transfer of heat which does not need any material medium is by ....
    a. conduction only. b. convection only.
    c. radiation only. d. convection and radiation.

12. Which of the following devices doesn't pollute the environment ? ....
a. Coal heater. b. Gas oven.
c. Solar oven. d. Petrol stove.

13. Which of the following devices pollutes the environment ? ....
a. Gas oven. b. Electric oven.
c. Electric heater. d. Electric stove.

14. The mechanical energy is converted into heat energy by ....
a. the electric generator (dynamo). b. the water heater.
c. friction of movement objects. d. the electric motor.

15. The Sun is ....
a. a resource of permanent energy. b. a resource of non-permanent energy.
c. not an energy resource. d. producing no energy.

16. Electric heater and electric water heater are considered from technological applications that depend on .... resource of energy.
a. non-permanent b. permanent
c. non-renewable d. renewable

17. In solar heaters, the solar energy is converted into .... energy.
a. light b. electric c. heat d. kinetic

18. In solar batteries, the solar energy is directly converted into ....
a. potential energy. b. electric energy.
c. mechanical energy. d. heat energy.

19. All of the following devices convert the solar energy into heat energy except ....
a. solar heater. b. solar cell.
c. solar oven. d. solar furnace.

2. Choose from column (B) what suits it in column (A) :

1.

(A)	(B)
1. Heat is transferred when you touch a hot metallic spoon	a. By convection and radiation.
2. Heat is transferred from heater to the air of the room	b. By conduction and radiation.
3. Heat is transferred from the Sun to us	c. By radiation.
	d. By conduction.

2.

(A) Technological application	(B) Changes of energy in it
1. Solar heater	a. chemical energy into heat energy.
2. Electric heater	b. solar energy into heat energy.
3. Solar cell	c. heat energy into chemical energy.
4. Gas stove	d. solar energy into electric energy.
	e. electric energy into heat energy.

3. Put (✓) or (×) in front of each of the following statements and correct the wrong ones :

1. Temperature of objects increases by increasing their speed. ( )
2. Temperature is inversely proportional to the kinetic energy of particles. ( )
3. By rubbing your hands together, heat energy is produced. ( )
4. Heat energy is transferred from a cold object to a hot object. ( )
5. Heat is transferred through different media by conduction and convection only. ( )
6. The transfer of heat between two objects stops when their temperatures become equal. ( )
7. Heat is transferred in solid materials by radiation. ( )
8. Heat is transferred from the Sun to the Earth by convection. ( )
9. Heat is transferred in solids and liquids by convection. ( )
10. Transfer of heat by radiation takes place through material media and space. ( )
11. When air is cooled, its density decreases, so it falls down. ( )
12. Hot air is more dense than cold air. ( )
13. The Sun is a permanent resource of energy, while electricity is a non-renewable resource of energy. ( )
14. In solar cells, the solar energy is converted into heat energy. ( )

4. Write the scientific term of each of the following :

1. A form of energy which is transferred from the object of higher temperature to that of lower temperature.
2. The heat condition which determines the direction of heat energy whether from or to the object when it comes in contact with another.
3. • The transfer of heat through some solid objects from the part with higher temperature to that with lower temperature.
   • The way by which the heat is transferred through copper or metallic wires.
4. The transfer of heat in gases and liquids, where hot molecules which have less density rise upwards, while cold molecules which have high density fall down.
5. • The transfer of heat from hot object to another without any need for a material medium through which heat transfers.
   • The way by which the heat is transferred from the Sun to the Earth.
6. It is the main source of the most energies on the Earth.

5. Complete the following statements :

1. Friction turns .... energy into .... energy.
2. The temperature of objects increases by increasing .... and ....
3. Heat energy is transferred from an object with .... temperature to another object with .... temperature.
4. Temperature is .... proportional to the kinetic energy of particles.
5. Heat is transferred in three methods which are .... , ... and ....
6. Heat is transferred through solids by .... , while through gases and liquids by ....
7. Heat is transferred through .... and .... by radiation.
8. Heat is transferred through iron by ...., while it is transferred through water by ....
9. The idea of making .... and .... depends on the transfer of heat by convection.
10. The idea of making cooking pans from aluminium depends on the transfer of heat by .... , while the idea of wearing the dark clothes in winter depends on the transfer of heat by ....
11. When air is heated, its density .... , so it moves .... to be replaced by cold air.
12. Heat is transferred through gases by .... and ....
13. The heat of the Sun reaches us by .... , while the heat of the electric heater reaches us by .... and ....
14. The Sun is a .... resource of energy, while petrol is a .... resource of energy.
15. .... , ... and .... are among the technological applications that produce heat energy.
16. Coal heater is from applications which .... the environment, while electric heater is among applications which .... the environment.
17. In petrol stove, ... energy changes into .... energy.
18. In solar heater, ... energy is converted into .... energy.
19. .... energy is changed into .... energy in the solar battery.
20. In photosynthesis process, ... energy changes into .... energy.

6. Complete the following table :

Technological application	The effect on the environment (Polluting / Non-polluting)
1. Electric heater :	....
2. Solar heater :	....
3. Electric stove :	....
4. Gas stove :	....
5. Solar oven :	....
6. Electric water heater :	....

7. Give reasons for :

1. You feel warm when you rub your hands together in winter.
2. The temperature of the bike frame rises after using the brakes directly.
3. The temperature of objects increases by increasing their speed.
4. The nail gets hot when you pull it out from a thick wooden piece.
5. You feel hot when you touch a hot metallic spoon.
6. The temperature of a hot metallic piece decreases when it is placed in a cup of cold water.
7. Cooking pans are made up of aluminium and copper.
8. • The freezer is found at the top of the fridge.
   • Air conditioner is put at a high position in the room.
9. The heater is placed on the ground.
10. The heat of the Sun doesn't reach the Earth by conduction or convection.
11. The heat of the Sun is transferred to us by radiation.
12. It is preferred to use the Sun and electricity as sources of heat energy than coal and petrol.
13. Importance of solar energy in our life.
14. Nuclear stations which produce electricity are preferred to those of petrol stations.
15. The production of electricity from solar energy is preferred to that produced from burning of fuel.
16. Solar energy is among preferable kinds of energy.
17. It is preferred using solar heater to any other heater such as gas heater or electric heater.

8. What is meant by ... ?

1. Heat energy.
2. Temperature.
3. Transfer of heat by conduction.
4. Transfer of heat by convection.
5. Transfer of heat by radiation.

9. Mention the changes of energy in the following and mention which of them is pollutant to the environment :

1. Solar cell.
2. Solar heater.
3. Electric heater.
4. Electric iron.
5. Petrol stove.
6. Electric stove.
7. Solar furnace.
8. Solar battery.

10. What happens when ... ?

1. Rubbing your hands together.
2. There is friction between a bike tire and a rough surface.
3. Removing a nail strongly from a wooden piece.
4. Increasing the speed of a group of objects and their friction with each other.
5. Two objects touch each other, one of them is hot and the other is cold.
6. A metallic piece of temperature 70°C touches another piece of temperature 30°C.
7. Two objects have the same temperature touch each other.
8. You touch the outer end of a metallic spoon placed inside a glass of hot water.
9. You fix the freezer in the lower part of refrigerator.
10. Putting the electric heater at a high place of the room.
11. You use a petrol stove (related to the environment).

11. Choose the odd word out, then write the scientific term of others :

1. Conduction – Convection – Friction – Radiation.
2. Sun – Coal – Petrol – Natural gas.
3. Solar oven – Petrol stove – Electric heater – Electric water heater.
4. Electric heater – Electric fan – Electric iron – Electric stove.
5. Solar furnace – Solar oven – Solar heater – Solar battery.

12. Compare between :

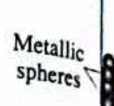
1. Transfer of heat by conduction, convection and radiation.
2. An electric heater and a coal heater (concerning : The effect on the environment, the resource of energy depending on it and the kind of energy resource).
3. Electric heater and solar heater.
4. Solid matter and liquid matter (concerning : The way of heat transfer)

13. Variant questions :

- (1) Mention briefly the ways of heat transfer.
- (2) When does the transfer of heat stop between two objects touching each other, the temperature of one of them is 100°C and that of the other is 60°C.
- (3) **Mention one application on the transfer of heat by :**
  a. Conduction. b. Convection. c. Radiation.
- (4) Mention some technological applications that produce heat energy and their energy resources.
- (5) Mention the technological applications depending on the solar energy.

14. Study the following figures, then answer the following questions :

(1) In the opposite figure, mention the reason of rising the temperature of the metallic spheres on shaking the jar several times.



(2) In the opposite figure :

- If the temperature of water in the beaker is 100°C.
- If the temperature of water in the cup is 20°C.
- If the nut fastener is transferred from the beaker to the cup.

Choose the correct answer :

1. The temperature of water in the cup becomes .... 20°C.
   a. less than b. more than c. equal to
2. The temperature of the nut fastener only becomes .... 100°C.
   a. less than b. more than c. equal to
3. The temperature of the nut fastener and water together in the cup may become ....
   a. 5°C. b. 25°C. c. 100°C.

(3) Study the two opposite figures, then mention :

a. The method of transferring heat in each of them.
b. The direction of transferring heat in figure (1).

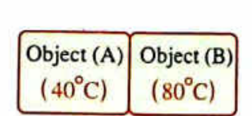
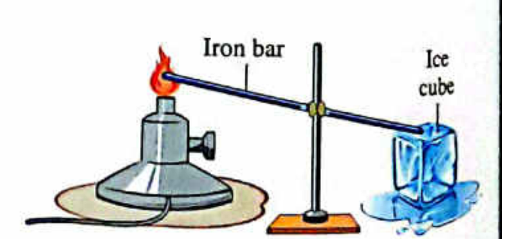


Fig. (1)


Fig. (2)

(4) Look at the following activity, then write your observation and conclusion.



(5) In the opposite figure what is the type of heat transfer in substances (A) and (B) ?





Thinking Skills Questions

1. Choose :

(1) In figure (1), metal balls from the same material were waxed in many rods of different materials. When they were supplied with heat, some balls dropped as in figure (2).

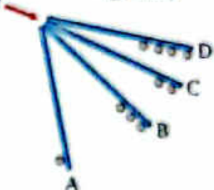
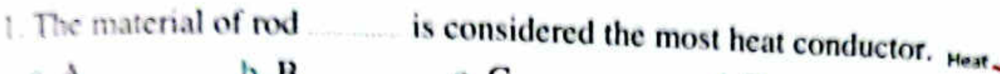


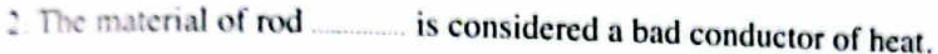
Fig. (1)

Fig. (2)



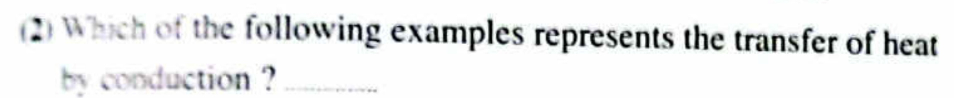
1. The material of rod .... is considered the most heat conductor.

a. A b. B c. C d. D



2. The material of rod .... is considered a bad conductor of heat.

a. A b. B c. C d. D



(2) Which of the following examples represents the transfer of heat by conduction ? ....

a. Placing the heating coil near the base of the boiler.

b. Rising the air above a burning candle flame.

c. Cooling a cup of tea by stirring it with a metal spoon.

d. Wearing white clothes while working in a sunny place.

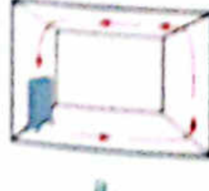
(3) Equal quantities of boiling water were placed in four identical sized vessels made of different materials, and after a few minutes the temperature of water in the four vessels was recorded in the following table :

Vessel	(1)	(2)	(3)	(4)
Temperature	43°C	37°C	75°C	68°C

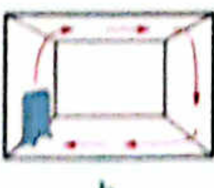
Which of these vessels has the highest thermal conductivity of its material ? ....

a. (1) b. (2) c. (3) d. (4)

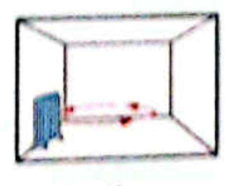
(4) A heater is placed on the ground of a room. Which of the following figures represents the movement of the air inside the room after turning on the heater ? ....



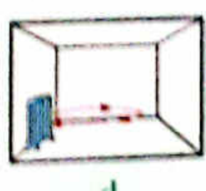
a.



b.

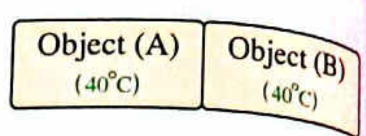


c.



d.

2. From the opposite figure, **does heat transfer from object (A) to object (B) ? Explain your answer.**



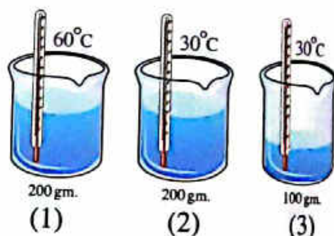
3. What do you suggest as an alternative to petrol as an energy resource if you are from desert Africa's population ?

4. Noha left two beakers filled with boiling water, one of them is covered and the other is not covered.

1. What are the transformations of matter that occur in the two beakers ?
2. At which beaker, the temperature of water decreases faster ? (Give a reason).

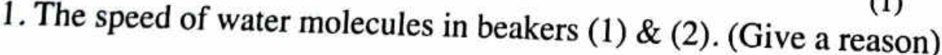
5. The teacher advised the pupils to lie on the ground when the smoke emitted from any fire. What is your interpretation of the teacher's advice in the light of your understanding of the concept of transferring the heat by convection ?

6. Study the opposite figures, then answer the following :



a. In which two beakers, the speed of water molecules are the same ? (Give a reason).

b. **Compare between :**


1. The speed of water molecules in beakers (1) & (2). (Give a reason)

2. The kinetic energy of water molecules in beakers (1) & (2). (Give a reason)

Project On UNIT TWO



A project to develop the analytical thinking "Determining reasons and results"

Complete the missing spaces in the following table :

Reasons	Results
(1) Leaving the string of a bow stretched.	....
(2)	Generates an energy which enables human to carry out digestion, respiration and metabolism processes.
(3) Decreasing the mass of a moving projectile to half and increasing its speed to double.	....
(4)	The body retains its same mechanical energy.
(5) Using nuclear and biological weapons in wars.	....
(6)	The deaf person realizes that someone outside is pressing the electric bell.
(7) Shaking a jar contains small pieces of ice.	....
(8)	Molecules of medium rise upwards and replaced by molecules from the cold medium.
(9) Touching a copper rod, its temperature is 100°C with an aluminium rod its temperature is 40°C	....
(10)	The stored chemical energy converts into electric energy.

UNIT 3

Diversity and Adaptation in Living Organisms

Lesson 1 | Living Organisms Diversity and Principles of their Classification.

Lesson 2 | Adaptation and Diversity of Living Organisms

Unit Objectives :

By the end of this unit, students will be able to :

- Observe the diversity among living organisms in their environment.
- Put plans to classify living organisms.
- Explain some principles of living organisms classification.
- Design tables to classify living organisms existed in your environment.
- Design with your classmates an album to classify some living organisms.
- Use the microscope to examine micro-organisms.
- Infer that the species is the basic unit of classification of living organisms.
- Identify the adaptation concept.
- Discuss your classmates about the reasons for adaptation.
- Identify the types of adaptation.
- Give evidences of adaptation in living organisms.
- Analyze the functional suitability of different types of the bird beaks and legs coped with their life styles and feeding.
- Understand the need of predator plants to capture insects as a resource of nitrogenous substances.
- Know more about the reasons of living organisms adaptation.
- Understand the reasons of hibernation, aestivation and birds migration.
- Appreciate the grandeur of Allah and Allah's peerless ability.

LESSON 1

Living Organisms Diversity and Principles of their Classification

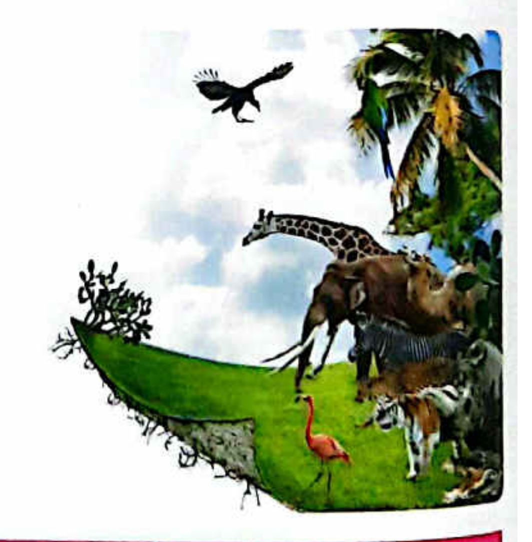


Why do scientists tend to classify living organisms ?



There are many examples of living organisms as :

- Animals.
- Plants.
- Micro-organisms.



SO, we must study :

First : Diversity of living organisms.

Second : Classification of living organisms.

FIRST Diversity of living organisms

Diversity of animals :

- When you pay a visit to the zoo, you may observe the variety among animals in a lot of different characteristics such as :
  - The size.
  - The environment, where animals live.
  - The shape.
  - The way of feeding.

The size

Big animals

Ex.: Rhinoceros, elephant and camel.



Rhinoceros

Small animals

Ex.: Rabbit, rat and lizard.



Rabbit

The environment, where animals live

Animals live in water

Ex.: Crocodiles, fishes and hippopotami.



Crocodile

Animals live on land

Ex.: Dog, horse and lion.



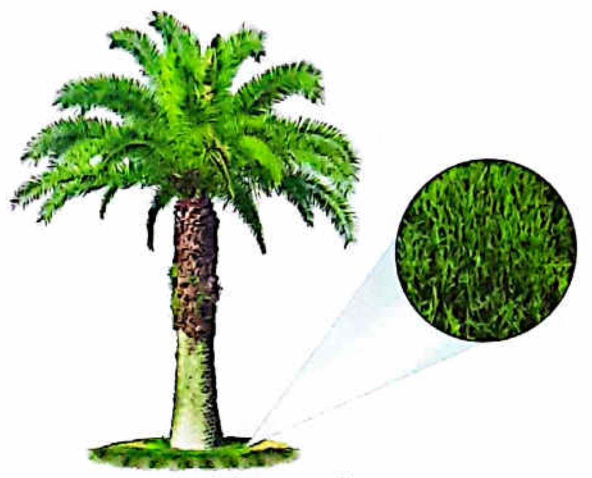
Dog

Diversity of plants :

- **Plants are different from each other in many characteristics such as :**
  - The length.
  - The size of the leaves.

The length

Huge trees	Short weeds
Ex.: Camphor and palm trees.	*Ex.:* Clover and gargeer.



Huge tree and short weeds

The size of the leaves

Plants carry large-sized leaves	Plants carry small-sized leaves
Ex.: Banana plant.	*Ex.:* Molukhiyah plant.



Leaves of banana plant



Leaves of molukhiyah plant

Diversity of micro-organisms :

Micro-organisms

They are living organisms that can't be seen by the naked eye, but they spread everywhere around us (in air, water and soil).

- Micro-organisms exist in pond water and can be seen only by the microscope.

Activity • To examine a drop of a stagnant pond water :

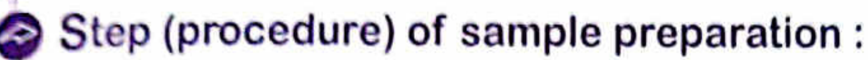




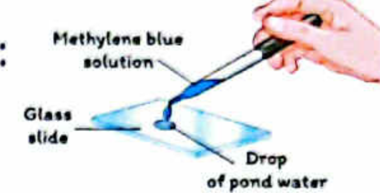


Tools:

- Pond water.
- A glass cover slip.
- A dropper.
- A glass slide.
- Methylene blue solution.
- A light microscope.



Step (procedure) of sample preparation :



Put a drop of pond water on the glass slide, then add a drop of methylene blue solution to it and cover it gently with the glass cover slip.

Steps of sample examination :

1. Put the glass slide on the microscope stage and use the objective lens to examine the sample.
2. Repeat the sample examination by using the higher power objective lens.



Microscope

Examination results :

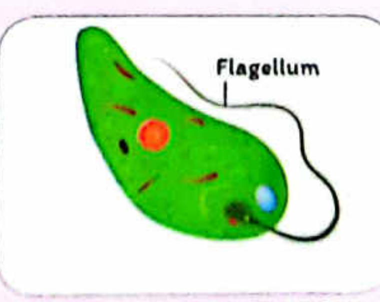
- Appearance of many living micro-organisms, most of them are **unicellular organisms**, such as :

• Amoeba. • Euglena. • Paramecium.

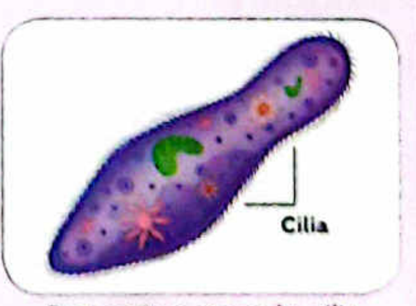
- Micro-organisms differ from each other in **shape** and **way of movement**.



Amoeba moves by pseudopods



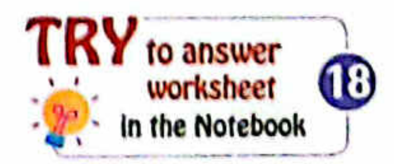
Euglena moves by flagellum



Paramecium moves by cilia

G.R. ***Amoeba, euglena and paramecium are classified as micro-organisms.***

Because they are unicellular organisms that can be seen only by the microscope.



SECOND Classification of living organisms

- Due to the enormous diversity in living organisms species, they must be classified into groups **to facilitate their study**.
- The science which is responsible for that is known as Taxonomy.

Taxonomy

It is a branch of biology that searches for the similarities and the differences among living organisms and it places the similar ones in groups according to a certain system in order to ease their study.

Plans of classification of living organisms

Classification of **plants**

According to :

1. External **shape**
2. Way of **reproduction**

Classification of **animals**

According to :

1. Nature of **body supporting**
2. Number of **legs in arthropods**
3. Number of **teeth in mammals**

Classification of plants :

1 Classification of plants according to the external shape (appearance) into:

A Some plants can't be distinguished into roots, stems and leaves

Ex.: Algae (green, red and brown algae).

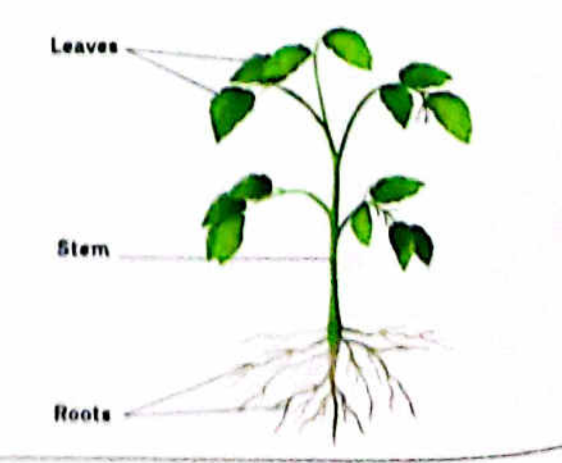
Green algae


Brown algae


Red algae

B Most of plants are distinguished into roots, stems and leaves

Ex.: Maize (corn), wheat, bean, palm tree and camphor.



2 Classification of plants according to their way of reproduction into :

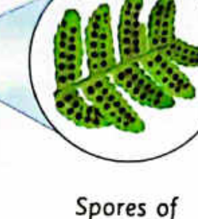
A Plants reproduce by formation of spores (Ferns)

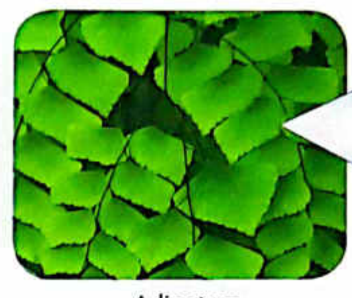
Ferns

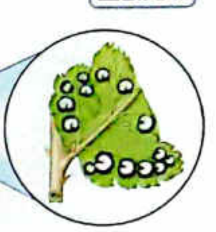
They are small terrestrial plants reproduce by formation of spores.

Ex.: Vougheir and adiantum.


Vougheir


Spores of vougheir plant


Adiantum


Spores of adiantum plant

B Plants reproduce by formation of seeds

1 Gymnosperms

Gymnosperms

They are non-flowering plants that their seeds are formed inside cones and not inside a pericarp (fruit envelope).

Ex.: Pine plant and cycas plant.



Pine plant


Cycas plant

2 Angiosperms

Angiosperms

They are flowering plants that their seeds are formed inside a pericarp.

- They are divided into :

a. Monocotyledon plants :



Ex.: Maize plant, wheat plant and palm tree.



Maize plant

b. Dicotyledon plants :

Ex.: Bean plant and pea plant.


Bean plant



Classification of animals :

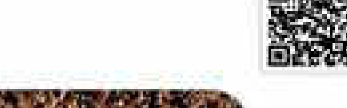


Classification of animals according to the nature of body supporting :

A Animals with soft bodies

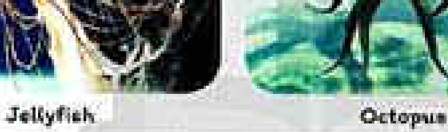
Their bodies don't have support.

Ex. : Jellyfish, octopus and earthworm.





Jellyfish



Octopus



Earthworm

B Animals with supported bodies

divided according to the location of the support into



Animals with external support

Ex. : Mussels and snails.



Desert snail

Animals with internal support

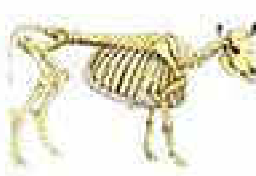
Ex. : Vertebrates (animals which have vertebral column) such as : Fishes, reptiles, birds and mammals.



Skeleton of bird



Skeleton of fish



Skeleton of cow

Vertebral column

Skeleton of crocodile



- Some animals are characterized by the presence of an internal support and an external support as : **Aquatic turtle**.



Aquatic turtle

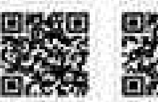
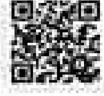


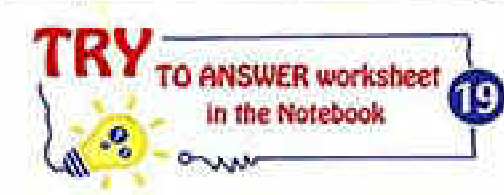
2 Classification of arthropods according to the number of legs :

Arthropods

They are invertebrate animals that are characterized by the presence of jointed legs.

- **Arthropods are classified according to number of legs into :**

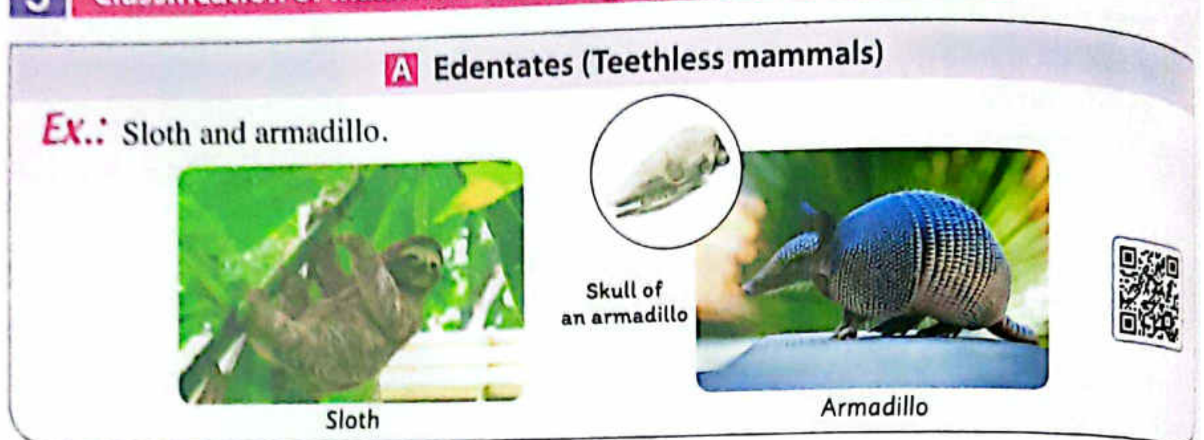
Insects	Arachnids	Myriapods
- They are characterized by the presence of **three pairs of jointed legs.**	- They are characterized by the presence of **four pairs of jointed legs.**	- They are characterized by the presence of **numerous legs.**
Ex. : Ants, locusts, bees, mosquito, flies and cockroaches.	Ex. : Spiders and scorpions.	Ex. : Scolopendra and julius.
 Ant	 Spider	 Scolopendra
 Cockroach	 Scorpion	 Julius
		



3 Classification of mammals according to the presence of teeth :

A Edentates (Teethless mammals)

Ex.: Sloth and armadillo.



Sloth
Armadillo

B Mammals having teeth

They are divided according to the shape, the kind and the number of teeth into :

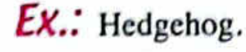




1

Animals that have front teeth extending outwards **G.R.**

To capture insects.



Ex.: Hedgehog.

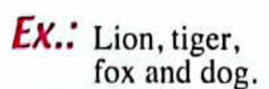

Hedgehog



Skull of a hedgehog

2

Animals that have pointed canines and molars with sharp projections.



Ex.: Lion, tiger, fox and dog.


Lion



Skull of a lion

3

- Animals that have sharp incisors.
- They are divided according to the **number of incisors** in each jaw into :

a. Rodents

They have **one pair** of incisors in **each jaw**.

Ex.: Rat, jerboa and squirrel.


Squirrel



Skull of a rat

b. Lagomorphs

They have **two pairs** of incisors in the **upper jaw** and **one pair** in the lower jaw.

Ex.: Rabbit.


Rabbit



Skull of a rabbit

Natural classification of living organisms :

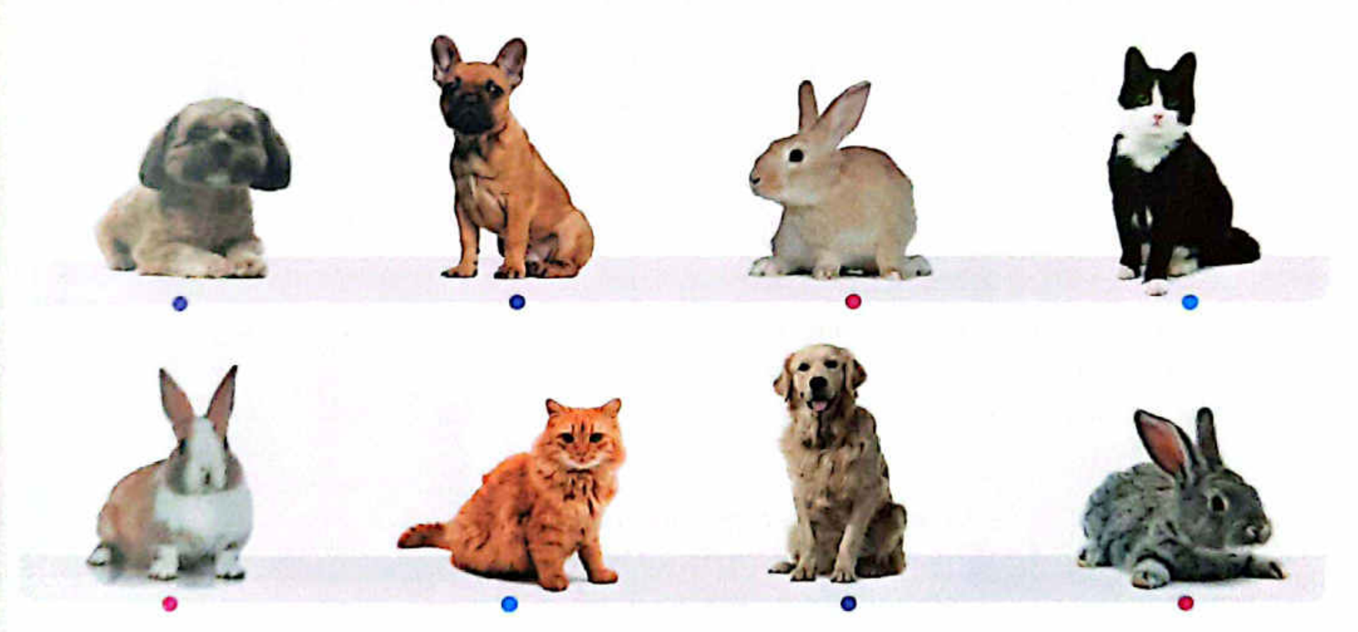
- Linnaeus used the species as a fundamental unit of natural classifying system.
  "Species" is the basic classification unit for living organisms.

Species

It is a group of more similar living organisms in shape that can reproduce to give birth of new fertile individuals, that are able to reproduce and keep the existence of the species.

Application on classification

- Look at this group of animals and classify them according to their external shape :



• You observe that :

These animals can be classified into three groups :

- **Cats.**
- **Dogs.**
- **Rabbits.**

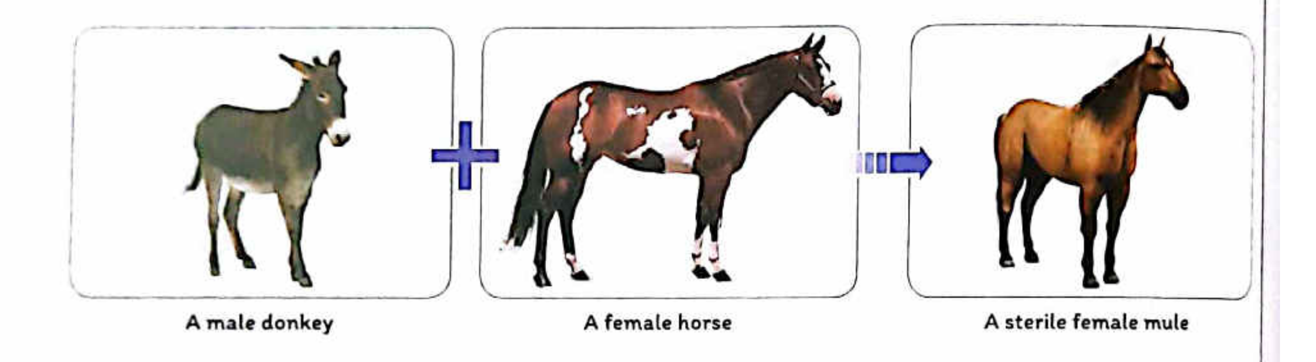
- **Although cats differ from each other, they differ more than rabbits and dogs, so :**
- Mating can take place between any couple of cats or dogs or rabbits whatever the difference in shape or size and the produced offspring is fertile from the same kind, so all cats are placed in one species, while rabbits are classified in another different species and so dogs.
- It is impossible for cats to mate with rabbits or rabbits with dogs or dogs with cats.

▸ Enrichment information

• *An intercourse may happen between some of the coupled (associated) species, but the product offspring is **sterile (barren)**.*

➲ **Example :** ***The intercourse between a male donkey and a female horse produces a sterile female called "Mule"*** **G.R.**

Because both are from two different kinds.



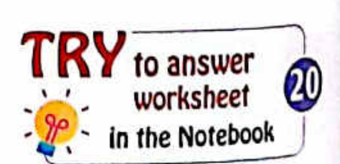
A male donkey | A female horse | A sterile female mule

NB **African, European** and **Asian human** whatever their colour, race or home are also belonging to one species (Human).



G.R. ***It is possible to produce a fertile individual from mating of an African man by an Asian woman.***

Because both of them are from the same kind.



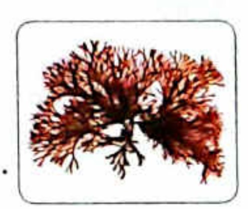
Remember Lesson One



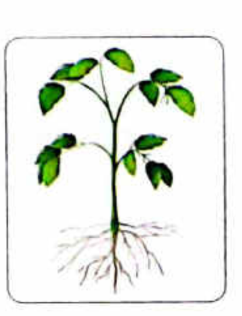
Classification of plants according to

External shape

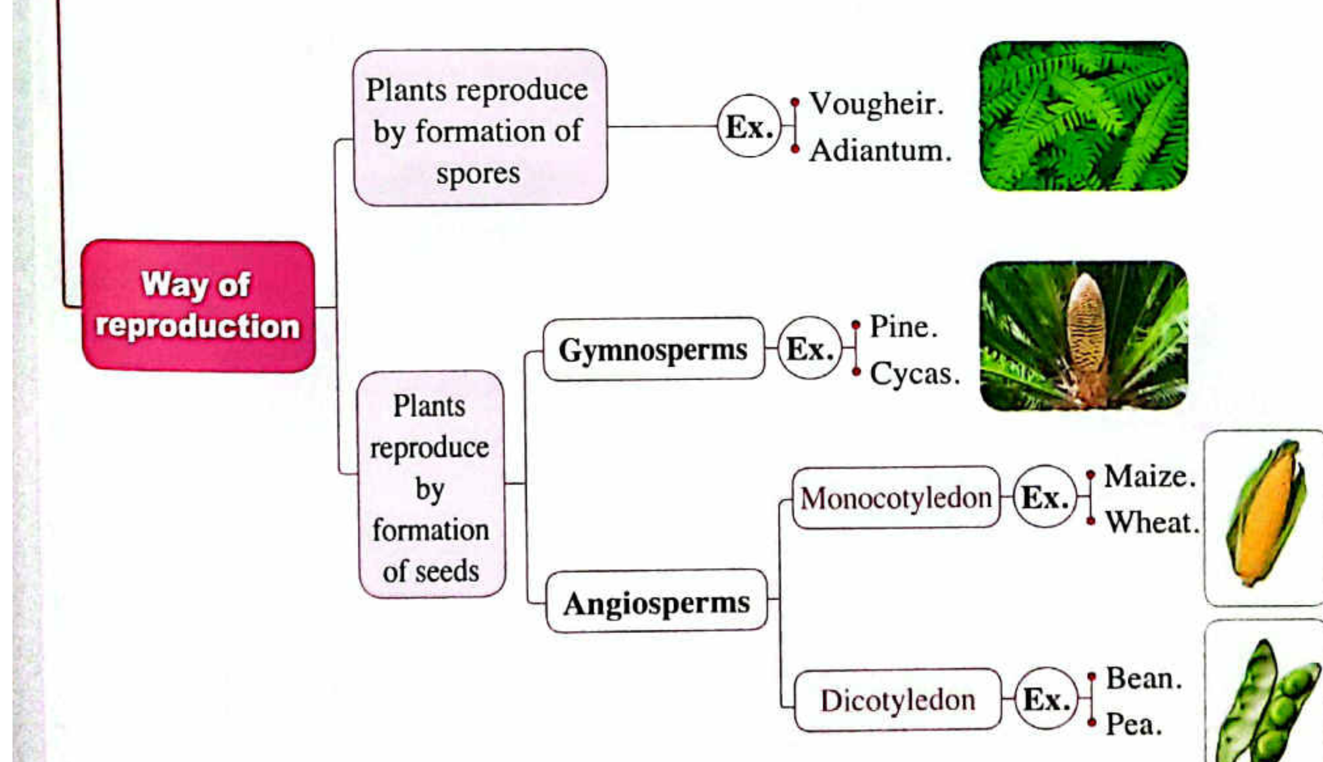
- **Some plants can't be distinguished into roots, stems & leaves**
  - Ex.:
    - Green algae.
    - Red algae.
    - Brown algae.

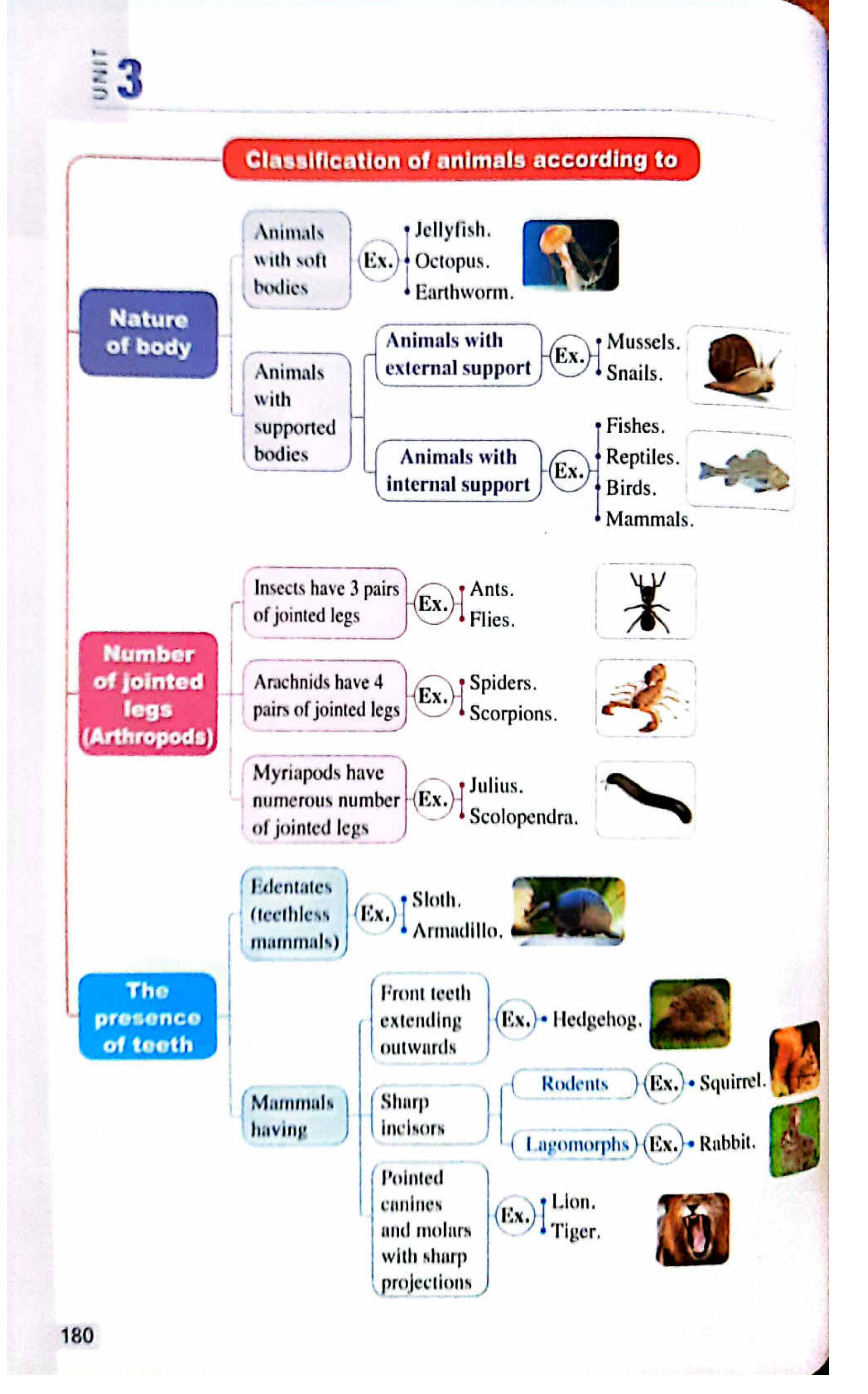


- **Most of plants are distinguished into roots, stems & leaves**
  - Ex.:
    - Maize.
    - Wheat.
    - Palm tree.
    - Camphor.

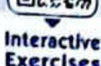


Way of reproduction




Classification of animals according to
Nature of body
Animals with soft bodies
Ex.
Jellyfish.
Octopus.
Earthworm.
Animals with supported bodies
Animals with external support
Ex.
Mussels.
Snails.
Animals with internal support
Ex.
Fishes.
Reptiles.
Birds.
Mammals.
Number of jointed legs (Arthropods)
Insects have 3 pairs of jointed legs
Ex.
Ants.
Flies.
Arachnids have 4 pairs of jointed legs
Ex.
Spiders.
Scorpions.
Myriapods have numerous number of jointed legs
Ex.
Julius.
Scolopendra.
The presence of teeth
Edentates (teethless mammals)
Ex.
Sloth.
Armadillo.
Mammals having
Front teeth extending outwards
Ex.
Hedgehog.
Sharp incisors
Rodents
Ex.
Squirrel.
Lagomorphs
Ex.
Rabbit.
Pointed canines and molars with sharp projections
Ex.
Lion.
Tiger.

Questions  on lesson One



Interactive Exercises

• Remember • Understand • Apply • Higher skills 📖 School book questions.

1. Choose the correct answer :

• 1. .... is one of the organisms that live in water.
a. Hippopotamus b. Dog c. Lion d. Horse

• 2. Amoeba, euglena and paramecium differ from each other in the ....
a. number of teeth. b. number of legs.
c. kind of support. d. way of movement.

• 3. Taxonomy is a branch of ....
a. biology. b. physics. c. chemistry. d. geology.

• 4. .... is one of the plants that can't be distinguished into roots, stems and leaves.
a. Alga b. Adiantum c. Maize d. Bean

• 5. 📖 .... is an example of plants that reproduce by spores.
a. Wheat b. Vougheir c. Bean d. Pine

• 6. Cycas plant belongs to ....
a. molusks. b. brown algae. c. gymnosperms. d. mosses.

• 7. From gymnosperm plants is ....
a. wheat. b. pine. c. maize. d. pea.

• 8. The seeds of gymnosperm plants exist inside ....
a. a pericarp. b. cones. c. a flower. d. a fruit envelope.

• 9. .... are considered from monocotyledon plants.
a. Bean and pea b. Camphor and clover
c. Maize and wheat d. Clover and gargeer

• 10. Dicotyledon plants belong to ....
a. angiosperms. b. ferns. c. gymnosperms. d. red algae.

• 11. 📖 Pea plant belongs to .... plants.
a. fern b. dicotyledon c. monocotyledon d. gymnosperm

• 12. 📖 .... are from the animals which don't have a body support.
a. Reptiles b. Snails c. Jellyfish d. Cartilaginous fish

• 13. .... are considered from the animals that have an external support.
a. Mussels b. Mammals c. Reptiles d. Fishes

• 14. .... are from animals that have an internal support.
a. Earthworms b. Fishes c. Snails d. Mussels

• 15. Arthropods are considered from ....

a. vertebrates. b. invertebrates. c. mammals. d. edentates.

• 16. Arthropods are classified into all the following species except ....

a. myriapods. b. arachnids. c. edentates. d. insects.

• 17. Cockroaches, bees, locusts are arthropod animals that belong to ....

a. ferns. b. arachnids. c. insects. d. myriapods.

• 18. Animal (A) differs from animal (B) in that it ....

a. has four legs.
b. has an external support.
c. has an internal support.
d. doesn't have any support.

(A) (B)

• 19. All insects have .... pair(s) of jointed legs.

a. one b. two c. three d. four

• 20. The scorpion belongs to ....

a. insects. b. arachnids. c. myriapods. d. mammals.

• 21. The number of pairs of scorpion legs is ....

a. 3 b. 4 c. 44 d. 100

• 22. .... is from myriapods.

a. Spider b. Julius c. Scorpion d. Bee

• 23. .... is from arthropods that have six legs.

a. Fly b. Scorpion c. Spider d. Julius

• 24. .... is from arthropods that have numerous legs.

a. Scorpion b. Scolopendra c. Spider d. Ant

• 25. The front teeth of .... are extending outwards to capture insects.

a. rat b. lion c. hedgehog d. squirrel

• 26. In rodents, the number of incisors in the lower jaw is .... pair(s).

a. one b. two c. three d. four

• 27. In lagomorphs, the number of incisors in the upper jaw is .... pair(s).

a. one b. two c. three d. four

• 28. .... is the scientist who used the species as a fundamental unit of natural classifying system.

a. Linnaeus b. Newton c. Bohr d. Max Planck

2. Choose from column (B), what suits it in column (A) :

①

(A)	(B)
1. Pine plant	a. is from ferns.
2. Molukhiyah	b. is from gymnosperms.
3. Clover	c. is from monocotyledons.
4. Wheat	d. is from dicotyledons.
5. Vougheir	e. has large-sized leaves.
6. Banana plant	f. has small-sized leaves.
7. Bean plant	g. is from algae.
	h. is from short weeds.

②

(A)	(B)
1. Edentates	a. have no support.
2. Insects	b. have large number of jointed legs.
3. Rodents	c. have pointed canines.
4. Myriapods	d. have no teeth.
5. Arachnids	e. have 3 pairs of jointed legs.
6. Lions	f. have 4 pairs of jointed legs.
	g. have one pair of incisors in upper jaw.

3. Put (✓) or (✗) in front of each of the following statements and correct the wrong ones :

1. Dog is an animal living in water. ( )
2. Banana tree carries large-sized leaves. ( )
3. Rhinoceros is a small-sized animal. ( )
4. Most of micro-organisms are unicellular organisms. ( )
5. Vougheir is a fern plant that reproduces by formation of spores. ( )
6. Pine and cycas plants are gymnosperms. ( )
7. Bean plant is considered from monocotyledon. ( )
8. Gymnosperms are classified into monocotyledon and dicotyledon plants. ( )
9. Angiosperms are called flowering plants. ( )

10. The seeds of gymnosperms are formed inside a pericarp. (
11. Animals can be classified according to the nature of body supporting. (
12. Worms and octopus are from vertebrates. (
13. Insects have three pairs of jointed legs, while myriapods have four pairs of jointed legs. (
14. Scorpion and spider belong to myriapods. (
15. Sloth and armadillo are edentates animals. (
16. Tigers have pointed canines and molars with sharp projections. (
17. Rat has front teeth extending outwards. (
18. Human belongs to one species although he differs in colour or race or home. (
19. Genus is the basic unit of classification of living organisms. (
20. Max Planck used the species as a fundamental unit of natural classifying system. (

4. Write the scientific term of each of the following :

1. Organisms that can't be seen by the naked eye and they spread in air, water and soil.
2. The branch of biology that searches for the similarities and differences among living organisms.
3. A group of plants that can't be distinguished into roots, stems, and leaves.
4. A group of terrestrial plants that reproduce by formation of spores.
5. Plants, whose seeds are formed inside cones and not inside a pericarp.
6. Flowering plants, whose seeds are formed inside a pericarp.
7. The invertebrate animals that are characterized by the presence of jointed legs.
8. A group of animals that have 3 pairs of jointed legs.
9. A group of animals that have 4 pairs of jointed legs.
10. A group of animals that have numerous legs.
11. A group of mammals that have no teeth.
12. A group of animals that have one pair of incisors in each jaw.
13. A group of animals that have two pairs of incisors in their upper jaw and one pair in their lower jaw.
14. • The basic classification unit of living organisms.
    • A set of similar animals in their shape and can get intermated together to produce fertile individuals.

5. Complete the following statements :

1. Animals differ from each other in many characteristics such as .... , ... and ....
2. Animals may be big as .... or small as .... and ....
3. .... and .... are from principles used in classifying plants.
4. .... and .... are from huge trees, while clover and .... are from short weeds.
5. Some plants have large-sized leaves such as .... and some have small-sized leaves such as ....
6. .... and .... are from examples of micro-organisms that live in water.
7. .... , ... and .... algae are considered from the plants that can't be distinguished into roots, stems and leaves.
8. .... and .... are considered from the plants that can be distinguished into roots, stems and leaves.
9. .... is from the plants that reproduce by formation of spores, while .... is from the plants that reproduce by formation of seeds inside cones.
10. Plants that reproduce by formation of seeds are divided into .... and ....
11. .... and .... plants are from gymnosperms.
12. Seeds of gymnosperms are formed inside .... , while that of angiosperms are formed inside ....
13. Flowering plants are classified into .... and .... plants.
14. .... and .... plants belong to monocotyledon plants, while .... plant is a dicotyledon plant.
15. The bodies of the animals are classified according to the existence of support into .... and ....
16. Jellyfish has .... body, while birds have .... bodies.
17. Vertebrates have an .... support, while mussels have an .... support.
18. Arthropods are invertebrates that are characterized by the presence of ....
19. Arthropods are classified according to the number of legs into .... , ... and ....
20. Arachnids have .... pairs of jointed legs as ....
21. Insects have .... pairs of jointed legs as .... and ....
22. The cockroach belongs to .... , whereas the scorpion belongs to .... and they are classified as .... animals.
23. .... and .... belong to teethless mammals.
24. Armadillo belongs to .... mammals and hedgehog belongs to .... mammals.
25. Animals that have sharp incisors are classified according to the number of incisors in each jaw into .... and ....

- 26. .... have one pair of incisors in each jaw such as ....
- 27. The number of jerboa's upper jaw incisors is .... and their number in the rabbit's upper jaw is ....
- 28. .... is the basic unit of classification of living organisms.

6. Give reasons for the following :

1. Living organisms must be classified.
2. We can distinguish between banana plant and molukhiyah plant.
3. Amoeba is from micro-organisms.
4. Adiantum plant is classified as a fern plant.
5. Cycas is a gymnosperm plant.
6. Pea and wheat plants are angiosperm plants.
7. The bodies of jellyfish and octopus are soft.
8. Cockroach and locust are classified as insects.
9. Spider and scorpion belong to arachnids.
10. Spider (or scorpion) isn't considered from insects.
11. Scolopendra and julius are classified as myriapods.
12. Sloth and armadillo are classified as edentates animals.
13. Hedgehog has front teeth extending outwards.
14. Squirrel (or rat) is from rodents, while rabbit is from lagomorphs.
15. The individuals of the same species differ in some external characteristics.
16. It is impossible for cat to mate rabbit.

7. What is meant by each of the following ... ?

1. Micro-organisms.
2. Taxonomy.
3. Algae.
4. Ferns.
5. Gymnosperms.
6. Angiosperms.
7. Arthropods.
8. Species.

8. Give an example of each of the following :

1. An animal of big size.
2. An animal of small size.
3. An animal lives in water.
4. An animal lives on land.
5. A huge tree.
6. Short weeds.
7. A plant carries large-sized leaves.
8. A plant carries small-sized leaves.
9. An organism that can't be seen by the naked eye and lives in pond water.

10. A plant that can't be distinguished into roots, stems and leaves.
11. A terrestrial (fern) plant.
12. A plant produces seeds inside cones.
13. A monocotyledon plant.
14. A dicotyledon plant.
15. An animal with a soft body.
16. An animal with an external support.
17. An animal with an internal support.
18. A vertebrate animal.
19. An insect.
20. An arachnid animal.
21. A myriapod animal.
22. An edentate animal.
23. An animal whose front teeth are extending outwards.
24. An animal with pointed canines and molars with sharp projections.
25. A rodent animal.
26. • An animal with two pairs of incisors in its upper jaw and one pair in its lower jaw.
    • A lagomorph animal.

9. Mention the difference between each of the following :

1. 📖 Bean and wheat.
2. Gymnosperms and angiosperms.
3. 📖 Pine and palm trees.
4. Adiantum and bean.
5. 📖 Insects and arachnids.
6. Sloth and hedgehog.
7. 📖 Rodents and lagomorphs.
8. 📖 Rabbit and squirrel.

10. Choose the odd word out and write the scientific term of others :

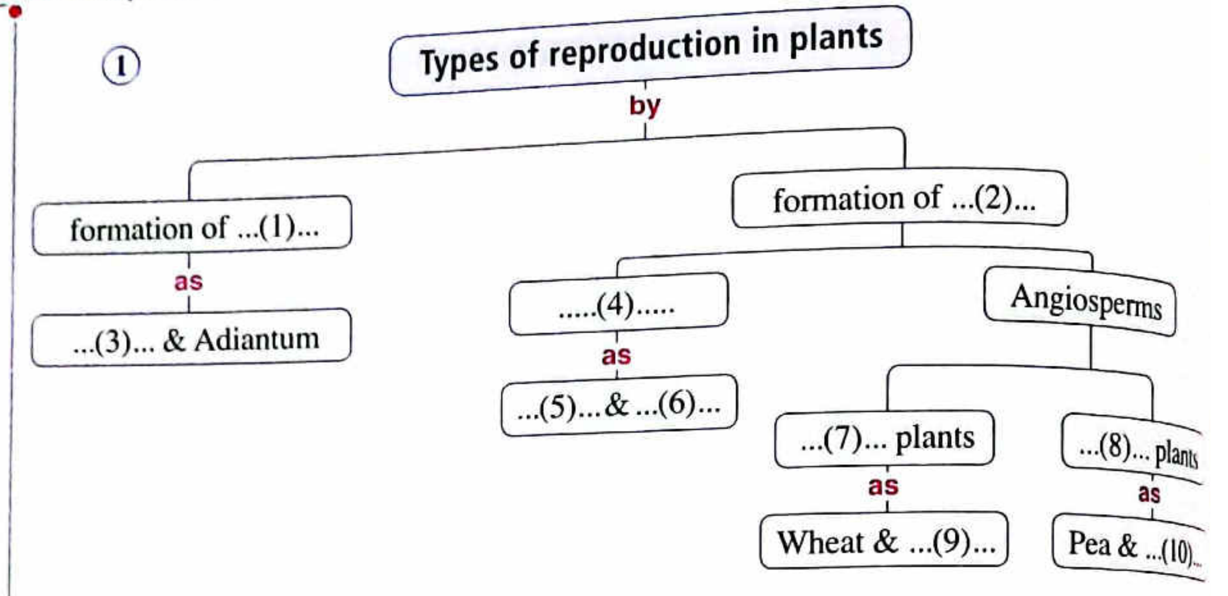
1. Fishes - Crocodiles - Lions - Hippopotami.
2. Clover - Paramecium - Amoeba - Euglena.
3. Palm - Vougheir - Adiantum - Ferns.
4. 📖 Wheat - Pea - Corn - Bean - Pine.
5. Scolopendra - Bee - Rabbit - Julius.
6. 📖 Cockroach - Flies - Spider - Mosquito - Locust.
7. Rabbit - Squirrel - Rat - Hedgehog.
8. 📖 Lion - Tiger - Dog - Wolf - Armadillo.
9. Reptiles - Snails - Birds - Mammals.
10. 📖 Octopus - Desert snail - Jellyfish - Earthworm.

11. What do you expect in each of the following cases ... ?

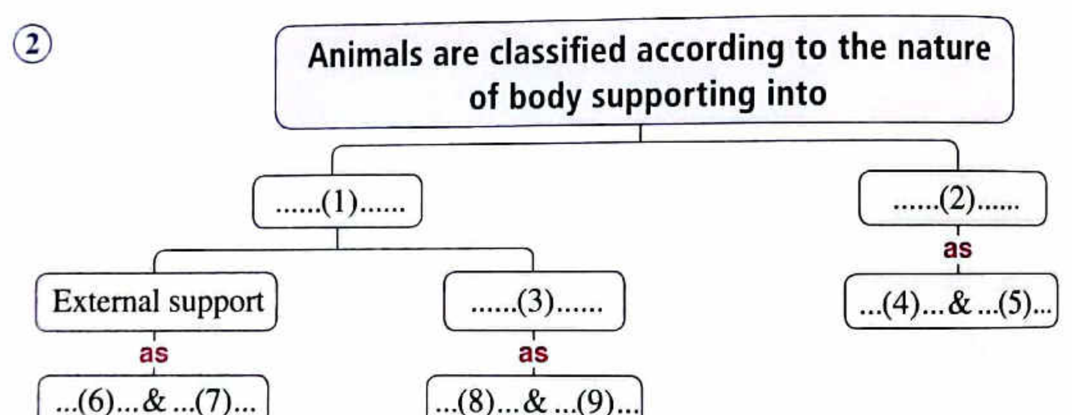
1. Removing the front teeth of hedgehog.
2. Mating between two individuals from the same species of living organisms.
3. Mating between a donkey and a horse.

12. Complete the following diagrams :

①



②



13. Variant questions :

1. What are the results based on increasing the well known species of living organisms?
2. **Classify :**
   (a) Plants according to : (1) External shape. (2) Way of reproduction.
   (b) Animals according to the nature of body supporting.
   (c) Arthropods according to the number of legs.
   (d) Mammals according to the kind and the number of teeth.
3. **Mention the number indicates each of the following :**
   (a) The number of pairs of jointed legs of spider.
   (b) The number of jointed legs of ant.
   (c) The number of teeth of armadillo.
   (d) The number of incisors in the upper jaw of rabbit.
   (e) The number of incisors in the lower jaw of rodents.

14. Classify the following organisms according to what you have studied :

1. Paramecium. 2. Wheat plant. 3. Lion.
4. Algae. 5. Mussel. 6. Squirrel.

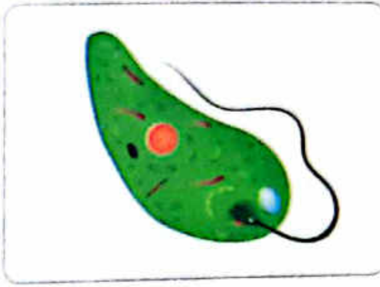
15. Study the following figures, then answer the following questions :

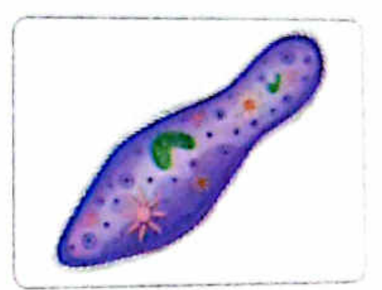
1 Look at the following figures, then answer :

1. What is the name of each of these organisms? What are the similarities and differences between them?
2. Explain the steps of examination of a sample containing these organisms.



Fig. (1)


Fig. (2)


Fig. (3)

2 The opposite figure represents a part of a plant :

1. What is the difference between this plant and bean plant ?
2. What is the similarity between this plant and cycas plant ?
3. Mention another example in the same classification of this plant.

3 The two opposite figures represent two parts of two different plants :

1. Classify each plant according to what you have studied.
2. Where are seeds formed in each of them ?
3. The part (X) is called .... (complete).
4. What is the difference between plant (1) and algae ?


(1)



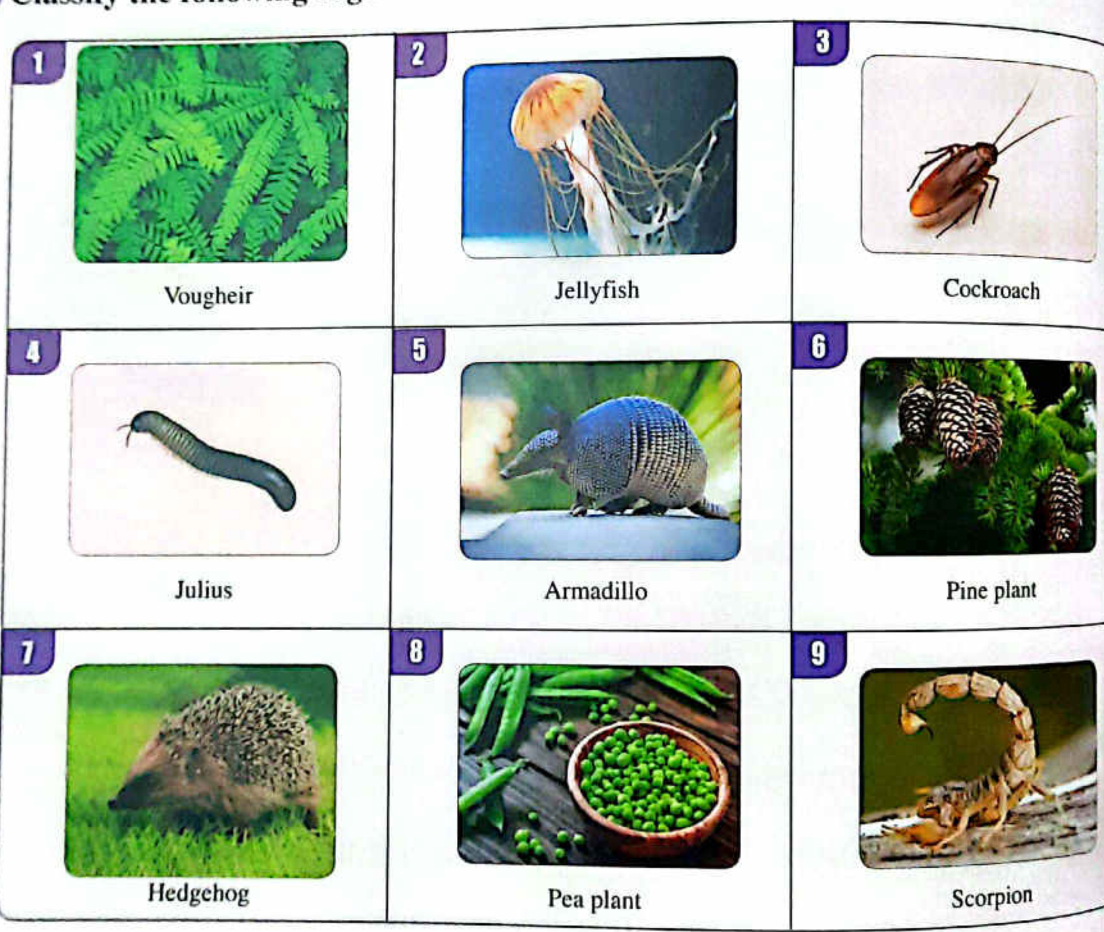
(2)

④ **The opposite figure represents an animal :**



1. Classify this animal.
2. What is the number of incisors in each jaw of this animal ?
3. What is the similarity and difference between this animal and rat ?

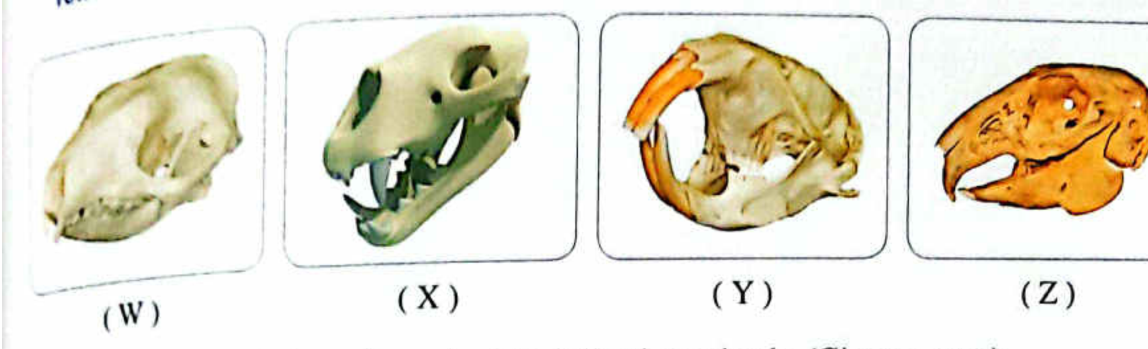
⑤ **Classify the following organisms according to what you have studied.**





Thinking Skills Questions

1. The following figures represent a group of skulls of several animals. Answer the following questions :



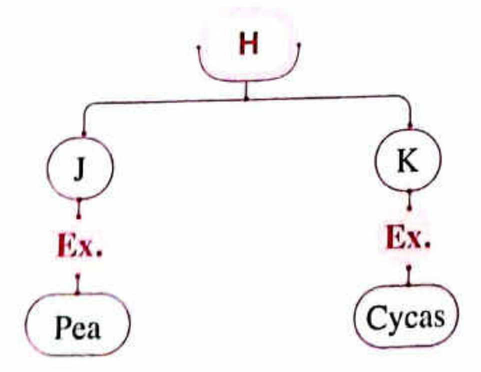
1. Choose the skull that suits each of the following animals. (Give a reason).
   (Rat - Tiger - Rabbit - Hedgehog).

2. What is the type of food of the animal whose skull represents :

   a. Fig. (W)

   b. Fig. (X).

2. Look at the following diagram, then choose the correct answer :



The previous diagram represents one of the plants taxonomic plans. Which of the following sentences is correct.

a. (H) reproduce by formation of spores.

b. (H) can't be distinguished into roots, stems and leaves.

c. (J) their seeds are formed inside a pericarp.

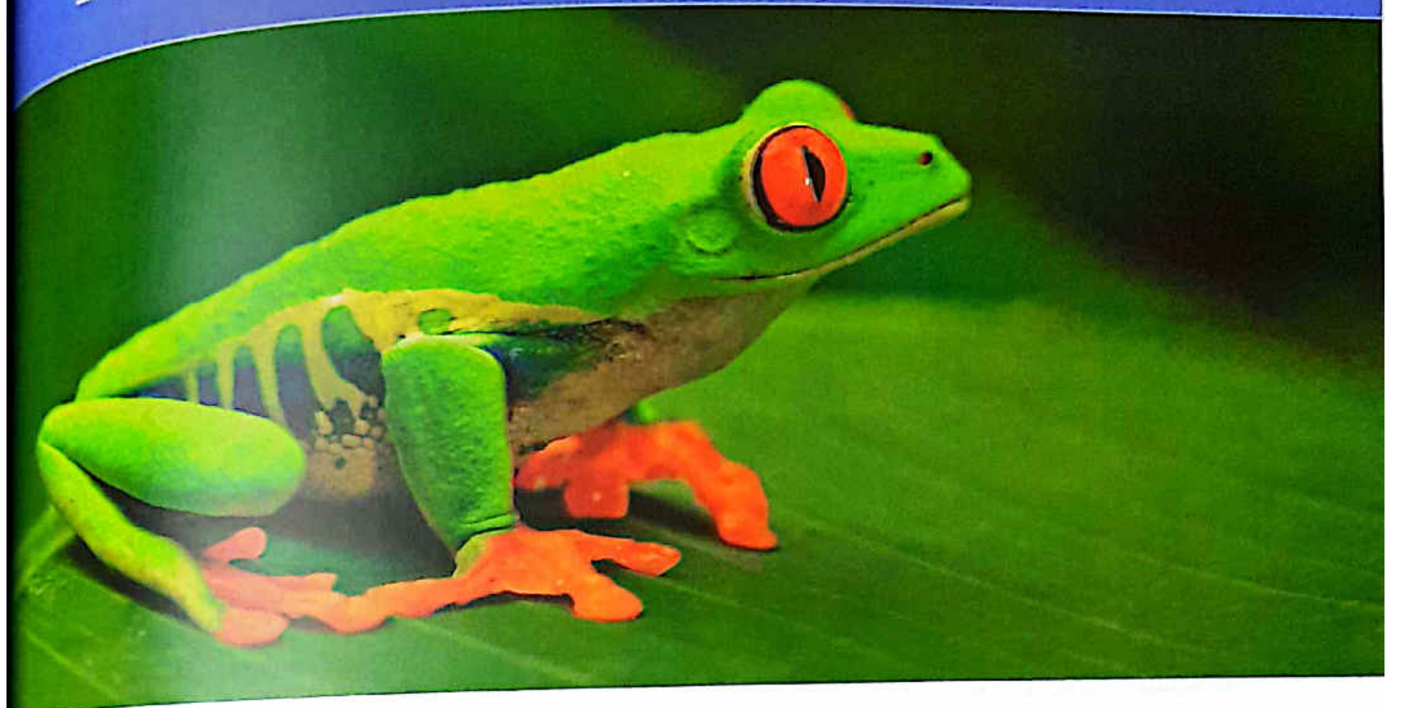
d. (K) flowering plants.

3. Choose from columns (B) & (C) what suit the figures in column (A) :

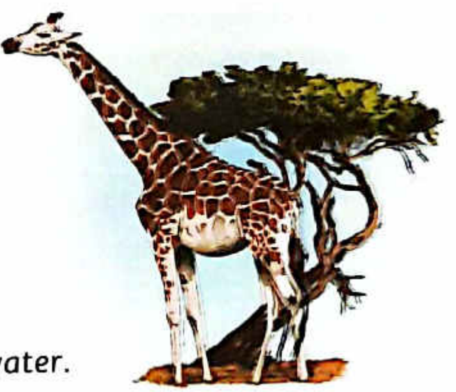
(A)	(B)	(C)
①	a. It is a micro-organism.	A. It reproduces by formation of seeds.
②	b. It is a terrestrial plant.	B. It has front teeth extending outwards.
③	c. It is a monocotyledon plant.	C. It has one pair of incisors in each jaw.
④	d. It is a rodent animal.	D. It moves by cilia.
⑤	e. It is a mammal animal.	E. It reproduces by formation of spores.

LESSON 2

Adaptation and Diversity of Living Organisms



Why do adaptation and diversity of living organisms take place ?



Multiplicity of environments where living organisms live is the most important reason that leads to living organisms' diversity in order to cope with the environmental changes such as :

- Climate change.
- Food diversity.
- Existence of water.

Examples :

Camel limbs

Camel pad ends in a thick flat one G.R.

To enable the camel wandering through the hot desert sand.



Horse limbs

Horse hoof ends in a strong solid end G.R.

To help the horse go through the rocky soil.



➲ **From the previous examples, we find that :**

The structures of a camel pad and a horse hoof suit the way of movement and the environmental conditions in which they live, and this is known as "Adaptation".

Adaptation :

Adaptation

It is a modification of a living organism's behaviour or its body structure, or even the biological functions of its organs to become more adapted to the environmental conditions where it lives in.

Types of adaptation

1 Structural (anatomical) adaptation:

It is a modification in the structure of one of body organs of a living organism to cope with the environmental conditions.

Examples :

- The camel pad structure.
- The horse hoof structure.



2 Functional adaptation:

It is a modification in some tissues and organs of the body of a living organism to become able to do specific functions.

Examples :

- Secreting poison in snakes.
- Secreting sweat in humans in case of high temperature.



3 Behavioural adaptation:

It is a modification in the behaviour of a living organism at specific times of the day or year.

Examples :

- Activity of birds during the daylight and bats at night.
- Birds migration at certain times of the year.



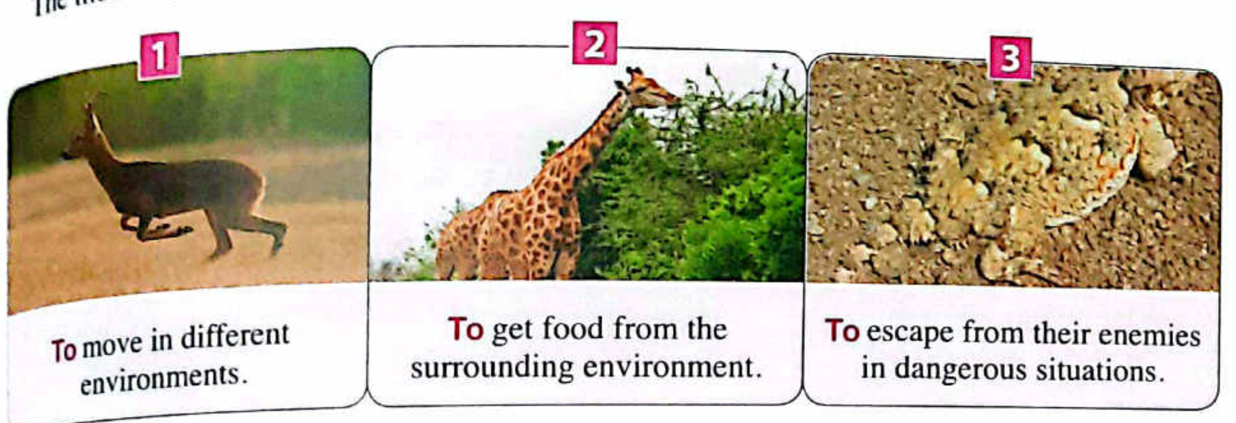
G.R.

- ***Secreting sweat in humans in case of high temperature is considered a functional adaptation.***
  Because it represents a modification in a specific organ to be able to do a specific function (secreting sweat).
- ***Birds migration is a behavioural adaptation.***
  Because it represents a modification in the behaviour of birds at a certain time in order to survive.

Reasons for adaptation

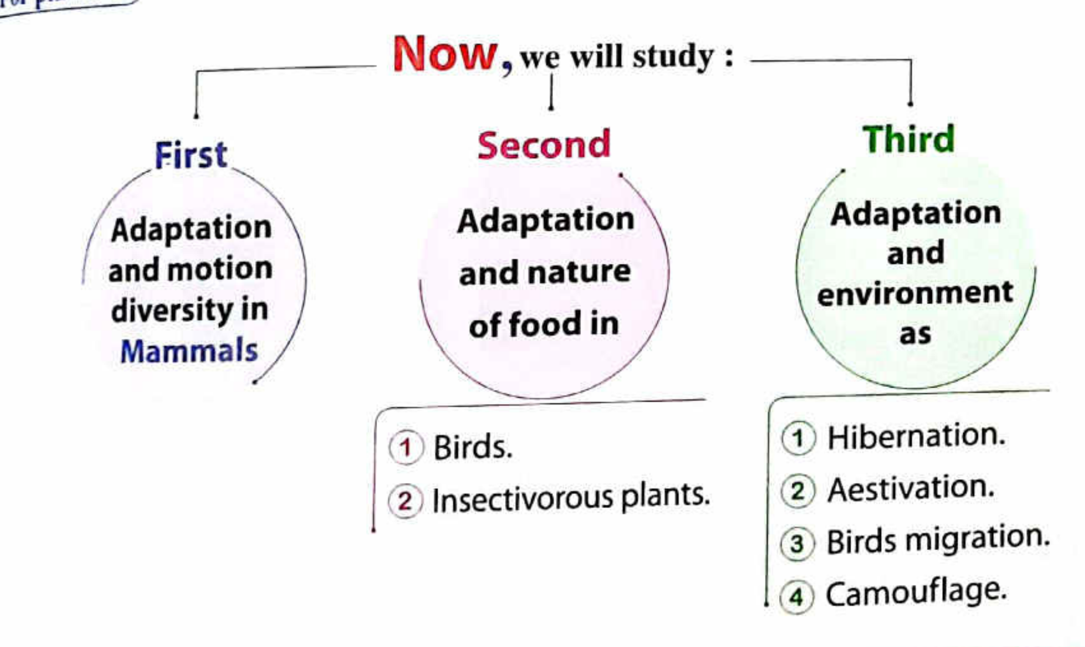
For animals :

The most important reasons for adaptation in animals are :



1. To move in different environments.
2. To get food from the surrounding environment.
3. To escape from their enemies in dangerous situations.

For plants : Most of plants adapt to the different environmental conditions.



FIRST Adaptation and motion diversity in mammals

- Mammals live in various environments, so they move in different ways such as : *walking, flying, swimming, climbing and diving*.
- **Although the limbs of all mammals are structured with similar bones, some modifications have happened to these limbs G.R.**
  - To match with the way of movement and the animal life style.
  - To match with the dominant environmental conditions.

* The following table shows the modifications in some mammals' front limbs to move in different ways that match with their environment :





Mammals	Whales, Dolphins and Sea lions	Bat	Horse	Monkeys or Gorillas
Modification in their front limbs	- The front limbs are modified to become paddles G.R.	- The front limbs are modified into wings G.R.	- The front limbs are modified into legs G.R.	- The long arms are due to elongation of the bones of the front limbs and fingers G.R.
Aim of modification	- *To perform the function of swimming and diving in water.*	- *To perform the function of flying.*	- *To perform the function of running.*	- *To perform the function of climbing trees and catching things.*
Type of adaptation	Structural adaptation			

Question

Complete :

1. .... and .... are from the reasons of adaptation in animals.
2. The bat's front limbs are modified into .... to enable it to ....
3. The horse's front limbs are modified into .... to enable it to ....
4. The whale's front limbs are modified into .... to enable it to ....

SECOND Adaptation and nature of food

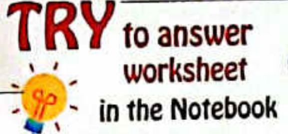
1 Adaptation and food diversity in birds :






* **The following table shows the modifications of birds' beaks and legs which are adapted to the food type, the way of movement and environmental conditions :**

Classification of birds according to the type of food	Birds feed on meat (Predatory birds)	Birds feed on worms and snails of shallow water	Birds feed on mosses and fish (Water birds)
Examples :	Hawks and vultures.	Heron and hoopoe.	Ducks and geese.
Modification of beaks :	Strong and sharp crooked beaks **G.R.** *To enable them to tear the prey's flesh.*	Long thin beaks **G.R.** *To help them to pick up worms and snails.*	Wide indented beaks in the two sides **G.R.** *To help them filter the food from water.*
Modification of legs :	Four bendable fingers ending in strong and sharp claws, three anterior (front) fingers and one posterior (back) **G.R.** *To control pouncing the prey.*	Long thin legs ending in thin fingers **G.R.** *To walk in the existence of water.*	Palm legs **G.R.** *To help them in swimming.*
Type of adaptation :	Structural adaptation		





2 Adaptation in insectivorous (insect-eating) plants :

Predacious (insectivorous) plants

They are self-feeding (autotrophic) green plants, that their roots can't absorb the nitrogenous substances from the soil needed to make proteins.

G.R. ***Insectivorous plants are self-feeding (autotrophic) green plants.***
Because they can make their food (carbohydrates) by photosynthesis process.

* **The following table shows examples of insectivorous plants :**




Examples	**Dieonea**	**Drosera**	**Halophila**
Modification occurred :	**Some parts of leaves of insectivorous plants are modified G.R.**		
Reason for modification :	To pounce (capture) and digest the insects, then absorb the nitrogenous substances that the plants' bodies need.		
Type of adaptation :	Structural adaptation		

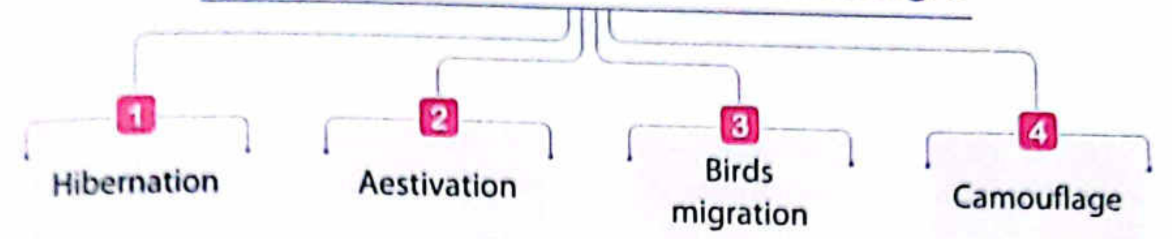
Question

Mention the type of adaptation of each of the following :

1. Activity of bats at night.
2. Secreting poison in snakes.
3. Leaves of insectivorous plants.

THIRD Adaptation and environment

Some forms of adaptation in living organisms with the environmental changes



1 Hibernation :



Hibernation

It is the behaviour through which some animals dormant and stop most of their vital activities to avoid the low temperature in winter.

* **The following table shows hibernation in some animals as a form of adaptation :**

Examples	Some reptiles and some insects.	Frogs (from amphibia)
Features of adaptation :	Hiding of some animals (as some reptiles and some insects) in burrows during winter G.R.	Some animals (as frogs and toads) bury themselves in mud, stop feeding and their activities decrease in winter G.R.
Reason for adaptation :	*To overcome the decrease in temperature.* But, in spring, when the environmental conditions become favourable, these organisms return back to their normal activities.	
Type of adaptation :	Behavioural adaptation.	

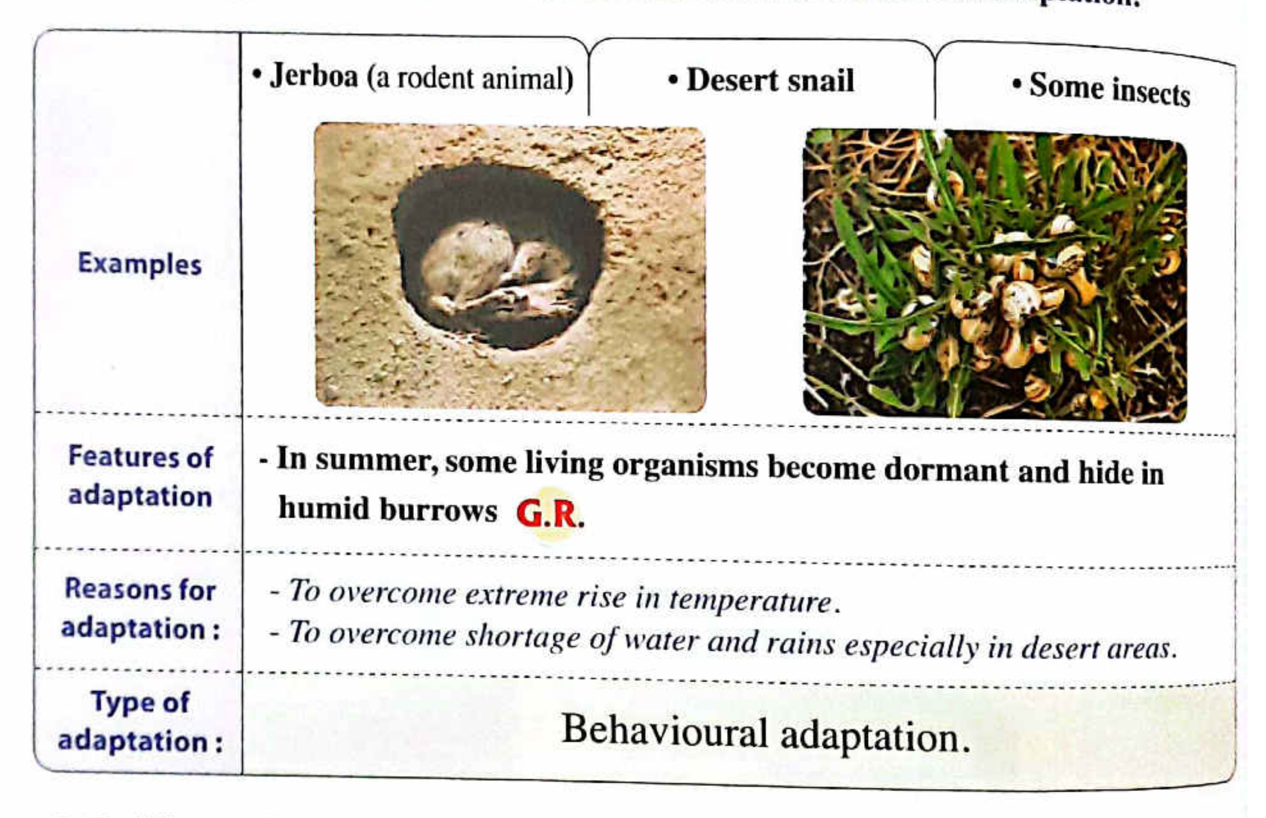
2 Aestivation :




Aestivation

It is the behaviour through which some animals dormant and stop most of their vital activities to avoid the extreme rise in temperature in summer and shortage of water and rains.

* **The following table shows aestivation in some animals as a form of adaptation:**



Examples	• **Jerboa** (a rodent animal)	• **Desert snail**	• **Some insects**
Features of adaptation	- **In summer, some living organisms become dormant and hide in humid burrows G.R.**		
Reasons for adaptation :	- *To overcome extreme rise in temperature.* - *To overcome shortage of water and rains especially in desert areas.*		
Type of adaptation :	Behavioural adaptation.		

▶ Enrichment information

- *Animals that hibernate or aestivate store an amount of food as fats in their bodies to provide them with energy needed to keep their life during the period of dormancy.*
- *Fats are characterized more than the other kinds of food by production of large quantities of water on their reusing. So, these animals store food and water together in the form of fats.*

What happens when ...?

A desert animal does not make aestivation in summer.

➲ It will die, because it can't tolerate the extreme rise in the temperature and shortage of water and rains.

3 Birds migration :



Birds migration

It is the inherited behaviour in some species of birds, where they migrate from cold and polar regions to more lighted and warmer regions for reproduction.

- Some species of birds adapt to the environmental conditions by migration.
- They migrate to the same places at the same time every year.



Birds migration

*** The following table shows migration in some birds as a form of adaptation :**

Example of birds migration	**Quail bird**
Feature of adaptation	**In winter, some species of birds (as Quail bird) migrate from cold and polar regions G.R.**
Reason for adaptation :	To search for more lighted and warmer regions for reproduction. **But,** in spring when the climatic conditions become favourable, these birds return back to their original habitats.
Type of adaptation :	Behavioural adaptation

What happens when ...?

Quail birds do not migrate from cold places in winter to warmer ones.

➲ They are unable to make reproduction process and may die.



4 Camouflage (Adaptation for hiding):

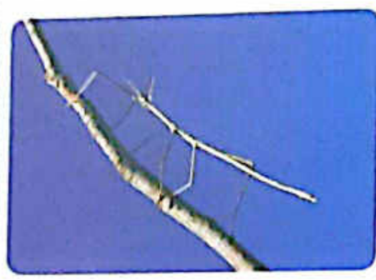




Camouflage

It is the ability of some living organisms to be hidden from their enemies or to capture the preys in the predatory species.

➲ Examples :

1 Leaf insect	2 Stick insect	3 Chameleon
		
It is hardly to be discovered by its enemies G.R. Because it looks like the plant leaf exactly in its colour and shape of wings.	**It is hardly to be discovered by its enemies G.R.** Because it looks like the branches of plants as well.	**It colours itself with the dominant colour of the environment G.R.** To be hidden from its preys of insects to capture them and feed on them.
(Structural adaptation)		(Functional adaptation)

What happens when ...?

Chameleon goes from green area to sandy area.

➲ Its colour changes from green to yellow.

Note

Camel is the desert ship :

- Camel is considered one of the most adapted animals to live in desert.
- It is an example of all kinds of adaptations **(structural, functional and behavioural)** that help it live in the hard conditions of desert.

TRY to answer worksheet 22

- General Exercise of the School Book on Unit 3
- Model Exams on Unit 3

In the Notebook

Remember  

Lesson Two

Adaptation :

It is a modification of a living organism's behaviour, or its body structure, or even the biological functions of its organs to become more adapted to the environmental conditions where it lives in.

Types of adaptation

① Structural (anatomical) adaptation:	② Functional adaptation:	③ Behavioural adaptation:
It is a modification in the structure of one of body organs of a living organism to cope with the environmental conditions.	It is a modification in some tissues and organs of the body of a living organism to become able to do specific functions.	It is a modification in the behaviour of a living organism at specific times of the day or year.
Ex.: The camel pad structure.	**Ex.:** Secreting poison in snakes.	**Ex.:** Birds migration at certain times of the year.

Adaptation and motion diversity in mammals

- The front limbs of whales and dolphins are modified to become paddles.
- The front limbs of bat are modified into wings.
- The front limbs of horse are modified into legs.
- The bones of the front limbs and fingers of monkey are elongated.

Adaptation and food diversity in birds

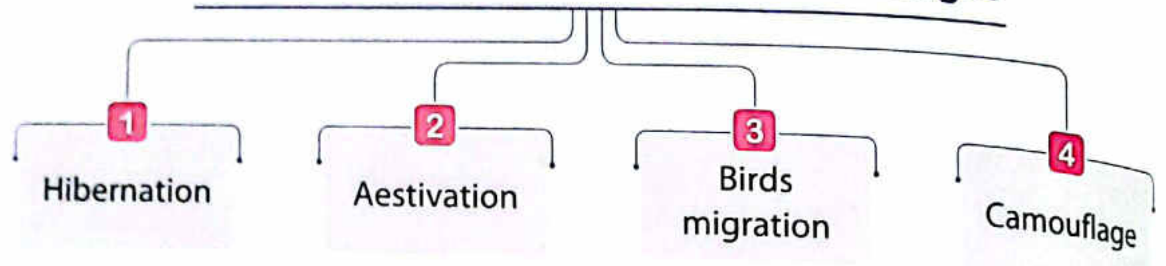
Birds feed on meat : [Hawks and vultures].	**Beaks :** Strong and sharp crooked beaks. **Legs :** Four fingers ending in strong and sharp claws.
Birds feed on worms and snails of shallow water : [Heron and hoopoe].	**Beaks :** Long thin beaks. **Legs :** Long thin legs ending in thin fingers.
Birds feed on mosses and fish : [Ducks and geese].	**Beaks :** Wide indented beaks in the two sides. **Legs :** Palm legs.

Adaptation in insectivorous plants

- Insectivorous plants are autotrophic green plants that cannot absorb the nitrogenous substances needed to make proteins, so some parts of these plants are modified to capture and digest insects to absorb the nitrogenous substances that the plants' bodies need.

  Ex.: Diconea, Drosera & Halophila.

Some forms of adaptation in living organisms with the environmental changes



- **Hibernation :** It is the behaviour through which some animals dormant and stop most of their vital activities to avoid the low temperature in winter.

  Ex.: Some reptiles, some insects, frogs and toads.

- **Aestivation :** It is the behaviour through which some animals dormant and stop most of their vital activities to avoid the extreme rise in temperature in summer and shortage of water and rains.

  Ex.: Jerboa, desert snail and some insects.

- **Birds migration :** It is the inherited behaviour in some species of birds, where they migrate from cold and polar regions to more lighted and warmer regions for reproduction.

  Ex.: Quail bird.

- **Camouflage :** It is the ability of some living organisms to be hidden from their enemies or to capture the preys in the predatory species.

  Ex.: Leaf insect, stick insect and chameleon.

- Camel is considered the desert ship and it is an example of all kinds of adaptation [Structural, functional and behavioural].

Questions  on lesson Two



• Remember • Understand • Apply • Higher skills School book questions.

1. Choose the correct answer :

1. The adaptation of camel pad enables it to ....
   a. walk in hot water. b. walk on hot desert sand.
   c. run on a rocky soil. d. capture the preys.

2. Secretion of poison in some snakes is an example of .... adaptation.
   a. anatomical b. functional c. behavioural d. structural

3. The activity of birds during the daylight is considered as an example of .... adaptation.
   a. anatomical b. functional c. behavioural d. structural

4. Which of the following is an example of the anatomical adaptation ? ....
   a. Secretion of sweat. b. Birds migration.
   c. Structure of horse foot. d. Activity of birds during daylight.

5. The activity of bees at the daylight and rats at night are examples of .... adaptation.
   a. behavioural b. structural c. functional d. anatomical

6. Mammals move in all the following ways except ....
   a. swimming. b. flying. c. absorption. d. running.

7. Ways of movement varied in mammals although all these mammals are structured with similar ....
   a. joints. b. bones. c. fingers. d. cartilages.

8. The front limbs of whales are modified into ....
   a. wings. b. hands. c. legs. d. paddles.

9. The organs of birds that are adapted for feeding are the ....
   a. beaks and wings. b. legs and beaks. c. beaks and eyes. d. wings and eyes.

10. The beaks of water birds are ....
    a. strong and sharp. b. wide indented. c. long and thin. d. thin and teethed.

11. Predatory birds have .... beaks.
    a. strong sharp b. long broad c. long thin d. broad teethed

12. The claws at the fingers of predatory birds are used for ....
    a. tearing prey's flesh. b. picking worms.
    c. pouncing the preys. d. walking in water.

13. The number of the anterior fingers of hawk is .... finger(s).
    a. 3 b. 4 c. 2 d. 1

14. The bat is considered from .... that fly.
a. insects b. reptiles c. mammals d. amphibians

15. The legs of birds that feed on worms and snails of shallow water are modified to ....
a. walk in water. b. swim. c. pick up snails. d. capture preys.

16. The beak of a hoopoe is ....
a. strong and sharp. b. long and thin.
c. wide indented in the two sides. d. strong and thin.

17. The bird that filters its food from water is the ....
a. eagle. b. duck. c. pigeon. d. hawk.

18. Insectivorous plants cannot absorb the nitrogenous substances to make ....
a. fats. b. sugar. c. carbohydrates. d. proteins.

19. Predatory plants are .... green plants.
a. heterotrophic b. saprophyte c. parasite d. autotrophic

20. .... are from the predatory plants.
a. Dieonea, bean and halophila b. Drosera, bean and dieonea
c. Dieonea, drosera and halophila d. Halophila, maize and dieonea

21. In winter, when temperature decreases, some reptiles undergo ....
a. hibernation. b. playing. c. feeding. d. aestivation.

22. The example of living organism that undergoes hibernation is the ....
a. frog. b. jerboa. c. desert snail. d. duck.

23. The animals that hibernate by burying themselves in mud are ....
a. toads. b. birds. c. insects. d. snakes.

24. In summer, desert animals suffer from a shortage of ....
a. light. b. food. c. oxygen. d. water.

25. All of the following are among the characteristics of the desert environment except the ....
a. rareness of water. b. strong wind.
c. plenty of water. d. high temperature.

26. .... is from rodents that undergo aestivation.
a. Rat b. Squirrel c. Jerboa d. Desert snail

27. .... bird migrates in winter.
a. Quail b. Ostrich c. Duck d. Sparrow

28. Migration of birds is a(an) .... behaviour.
a. accepted b. acquired c. inherited d. common

29. .... insect exactly looks like the plant branches.
a. Stick b. Beetle c. Leaf d. Locust

30. Chameleon can colour itself with the .... colours of the environment.
a. permanent b. temporary c. dominant d. constant

2. Choose from column (B) what suits it in column (A) :

①

(A)	(B)
1. Secreting poison in snakes	a. is an example of structural adaptation.
2. The horse hoof structure	b. is an example of functional adaptation.
3. Birds migration	c. is an example of traditional adaptation.
	d. is an example of behavioural adaptation.

②

(A)	(B)
1. Jerboa	a. hibernate in winter.
2. Camel	b. hides in burrows during winter.
3. Quail	c. is an example of all types of adaptation.
4. Frogs	d. aestivates in summer.
	e. migrates from cold areas to warm ones.

3. Choose from columns (B) and (C) what suit them in column (A) :

(A)	(B)	(C)
1. Monkeys:	A. Have strong sharp beaks	a. to filter their food from water.
2. Horses:	B. Their front limbs are modified into paddles	b. to perform the function of flying.
3. Bats:	C. Their bones of the front limbs and fingers are elongated	c. to tear the prey's flesh.
4. Sea lions:	D. Their limbs end in flat thick pad	d. to perform the function of climbing.
5. Geese:	E. Their limbs end in strong solid hoof	e. to perform the function of swimming and diving.
6. Hawks:	F. Their front limbs are modified into wings	f. to walk on hot desert sand.
7. Camels:	G. Have wide indented beaks at both sides	g. to run on rocky soil.

4. Put (✓) or (×) in front of each of the following statements and correct the wrong ones :

1. Activity of birds during the daylight and bats at night are examples of functional adaptation. ( )
2. Mammals' limbs were modified in many forms to suit their ways of movement. ( )

3. All mammals walk on four limbs. ( )
4. The front limbs of dolphins are modified into wings. ( )
5. The bones of front limbs in bats are elongated to help them climb trees. ( )
6. Beaks and legs of birds are adapted to the way of feeding. ( )
7. The five fingers of predatory birds end in strong and sharp claws. ( )
8. The birds that feed on aquatic snails and worms have long thin beaks and long thin legs. ( )
9. The birds that feed on mosses and fish have narrow indented beaks and palm legs. ( )
10. Insectivorous plants can't absorb the nitrogenous substances that needed to make fats. ( )
11. Drosera, halophila and dieonea are heterotrophic insectivorous plants. ( )
12. Hibernation and camouflage are among forms of adaptation of living organisms. ( )
13. Frogs hibernate in summer by hiding in burrows. ( )
14. Some insects hibernate to overcome the rising in temperature. ( )
15. Aestivation and hibernation are from examples of behavioural adaptation. ( )
16. Jerboa tries to aestivate, while quail bird tries to hibernate. ( )
17. The desert is characterized by plenty of water and high temperature. ( )
18. In summer, some birds migrate then return back to their original habitats in spring. ( )
19. Birds migration is an acquired behaviour. ( )
20. Camouflage is the ability of some living organisms to be hidden from their enemies or to capture the preys in the predatory species. ( )
21. Stick insect looks like the plant leaf in its colour and shape of wings. ( )
22. Chameleon colours itself with the dominant colours in the environment. ( )

5. Write the scientific term of each of the following :

1. The modification of a living organism's behaviour, body structure or organs biological function in order to become suitable for the environment, where it lives in.
2. The modification in the structure of one of body organs to cope the environmental conditions.
3. The ability of some body organs and tissues to do certain functions.
4. The modification in the behaviour of a living organism at specific times of the day or year.
5. • The plants which feed on insects.
   • The plants that are self-feeding and can make carbohydrates, but they can't make proteins.
   • The plants that can't absorb the nitrogenous substances from the soil.
6. The behaviour that some animals do by hiding in burrows to avoid the low temperature in winter.

7. The behaviour that some animals do by hiding in humid burrows to avoid the extreme rise in temperature in summer .

8. The inherited behaviour in some species of birds, where they migrate from cold and polar regions to more lighted and warmer regions for reproduction.

9. The ability of some living organisms to simulate the dominant environmental conditions to be hidden from their enemies or even to capture the preys.

6. Complete the following statements :

1. .... , ... and .... are from the environmental changes that lead to adaptation.
2. Horses limbs end in .... to run over rocky soil, whereas camels limbs end in .... to walk on hot sandy soil.
3. Types of adaptation are anatomical (structural), ... and ....
4. The structure of horse limbs is an example of .... adaptation.
5. Birds migration is an example of .... adaptation, while secretion of sweat in human body on rising temperature is an example of .... adaptation.
6. .... and .... are from the reasons of adaptation in animals.
7. The whale front limbs are modified into .... to take the role of .... , whereas they are modified in the bat into .... to take the role of ....
8. The bones of monkey front limbs and fingers are .... to enable it to .... trees and .... objects.
9. .... and .... of birds are modified according to food type and the way of movement.
10. .... and .... are examples of predatory birds.
11. Fingers of hawks end in strong sharp ....
12. In predatory birds, the three anterior fingers and the posterior one are used to control ....
13. .... and .... are from the birds that feed on worms and snails of shallow water.
14. Birds that swim in water have .... legs to help them in ....
15. Hawks have .... beaks to tear the prey, whereas ducks have .... beaks to filter food from water.
16. Insectivorous plants are .... green plants as they can perform .... process, so they can make carbohydrates.
17. .... and .... are examples of insectivorous plants.
18. .... , ... and .... are considered among forms of adaptation in living organisms with the environmental conditions.
19. Some animals as .... and .... hide in burrows to overcome the low temperature.

• 20. In winter, frogs bury themselves in mud and that is called ………… , while in summer jerboa hides in humid burrows and that is called …………

• 21. ………… , ………… and ………… are examples of animals that undergo aestivation process.

• 22. In winter, some birds migrate from cold and polar regions to more ………… and ………… regions for …………

• 23. ………… and ………… are considered among the insects which are adapted by camouflage.

• 24. ………… insect looks like the leaf of the plant, while ………… insect looks like the branches of plants.

• 25. Camel is an example of ………… , ………… and ………… adaptation.

7. Give a reason for each of the following :

1. The diversity and adaptation of living organisms.
2. Camel limbs end in a thick flat pad.
3. Horse limbs end in a strong solid hoof.
4. Secreting poison in snakes is considered a functional adaptation, while the shape of horse limb is considered a structural (anatomical) adaptation.
5. Secreting sweat in humans in case of high temperature is considered a functional adaptation.
6. Birds migration is a behavioural adaptation.
7. Occurrence of adaptation in animal world.
8. • Mammals limbs are adapted in many forms.
   • Although limbs of mammals are composed of the same bones, some modifications took place in them.
9. The front limbs of whales and sea lions are modified into paddles.
10. Bat front limbs are modified into wings.
11. In monkeys, bones of the front limbs and fingers are elongated.
12. The two front limbs in the dolphin are different from that of a bat although they are structured with similar bones.
13. Beaks and legs of birds are modified in many different ways.
14. Predatory birds have strong and sharp crooked beaks.
15. • The fingers of predatory birds end in strong sharp claws.
    • The legs of predatory birds have three anterior fingers and posterior one.
16. Some birds have long and thin beaks and their long legs end in thin toes.
17. Ducks and geese have wide indented beaks and palm legs.
18. Insectivorous plants are autotrophic plants.
19. Some parts of leaves of insectivorous plants are modified.

20. Some plants pounce insects.
21. • Some animals undergo hibernation.
    • Some reptiles hide in burrows, while frogs bury themselves in mud and stop feeding in winter.
22. • Some animals undergo aestivation.
    • Jerboa becomes dormant and hides in humid burrows in summer.
23. Some species of birds migrate from their original habitats in winter.
24. Quail bird is a good example of adaptation to the environmental conditions.
25. Leaf insect is hardly to be discovered by its enemies.
26. It is hard to discover the stick insect.
27. Chameleon colours itself with the dominant colour in the environment.
28. The camel is considered a desert ship.

8. What is the function (or importance) of each of the following ... ?

1. The thick flat pad at the end of camel limb.
2. The strong solid hoof at the end of horse limb.
3. Adaptation in animals.
4. Adaptation in plants.
5. The two wings of a bat.
6. The paddles of whales and dolphins.
7. The elongated front limbs in monkeys.
8. The strong and sharp crooked beaks of hawks.
9. The sharp claws in vultures.
10. The long beaks in hoopoe.
11. The thin leg ending in thin fingers in the heron.
12. The wide indented beaks in the ducks.
13. The palm legs in the geese.
14. Camouflage in continuation of life of some living organisms.

9. Give an example of each of the following :

1. • An animal whose limbs end in a strong solid hoof.
   • A mammal animal can run on the rocky soil.
2. An animal, whose limbs end in a thick flat pad.
3. Structural (anatomical) adaptation.
4. Functional adaptation.
5. Behavioural adaptation.



6. A mammal animal whose two front limbs are modified into paddles.
7. A mammal animal whose two front limbs are modified into wings.
8. An animal, whose front limbs and fingers are elongated.
9. A predatory bird.
10. A bird, whose beak is strong and sharp.
11. A bird, whose fingers ending in strong sharp claws.
12. A bird feeds on worms and snails of shallow water.
13. A bird, whose legs are long and thin.
14. A bird feeds on mosses.
15. A bird, whose beak is wide indented in the two sides.
16. An insectivorous plant.
17. Hibernation in amphibia.
18. Aestivation in rodents.
19. A migratory bird.
20. Camouflage in insects.
21. The insect, which looks like the plant leaf exactly in its colour and shape of wings.
22. The insect, which exactly looks like the branches of the plant.
23. An animal, which colours itself with the dominant colours of the environment to be hidden from its preys of insects.

10. What is meant by ... ?

1. Adaptation.
2. Anatomical adaptation.
3. Functional adaptation.
4. Behavioural adaptation.
5. Predacious plants.
6. Hibernation.
7. Aestivation.
8. Birds migration.
9. Camouflage (Give an example).

11. What do you expect in each of the following cases ... ?

1. Camel exchanges its pad with a horse hoof.
2. The front limbs of whales are not modified into paddles.
3. The bones of front limbs and fingers of monkeys are not elongated.
4. The front limbs of bats are not modified into wings.
5. The beaks of predatory birds are weak.

6. • The fingers of predatory birds are not ended in claws.
   • The four fingers of predatory birds lie at the same side.
7. The beaks of ducks are narrow and not indented.
8. The legs of geese are not palm.
9. The beak of heron is not long and thin.
10. The beaks of hoopoe and hawk are mutually exchanged.
11. Predatory plants cannot capture insects for a long period of time.
12. • No aestivation occurs to jerboa.
    • A desert animal does not make aestivation in summer.
13. The aestivated animals don't store their food in the form of fats.
14. The polar bear cannot undergo hibernation.
15. Quail birds do not migrate from cold places in winter to warmer ones.
16. Chameleon can't make camouflage process.
17. Stick insect or leaf insect settle on a white wall.

12. Mention the type of adaptation which happens in each of the following and why ?

1. The limbs of camel.
2. The limbs of horse.
3. The front limbs of whale.
4. The front limbs of bat.
5. The front limbs and fingers of monkey.
6. The beaks of vultures.
7. The beak of heron.
8. The beak of duck.
9. Legs of a hawk.
10. Legs of a heron.
11. Legs of geese.
12. Leaves of predacious plants as halophila.

13. Mention the type of adaptation of each of the following :

1. The camel pad structure.
2. Secreting sweat in humans.
3. Birds migration.
4. Activity of bats at night.
5. Secreting poison in snakes.
6. Beaks of predatory birds.
7. Leaves of insectivorous plants.

14. Give an example to show the adaptation of the following living organisms with environmental conditions :

1. Ducks.
2. Heron.
3. Hedgehog.
4. Dieonea.

15. Choose the odd word out and write the scientific term of others :

1. Functional adaptation – Food adaptation – Anatomical adaptation – Behavioural adaptation.
2. Walking – Swimming – Flying – Climbing – Respiration.
3. Secreting honey related to bees – Secreting poison related to snakes – Feathers related to birds – Secreting sweat related to human.
4. Whales – Bats – Dolphins – Sea lions.
5. Ducks – Hawk – Vulture – Crow.
6. Geese – Sea lion – Ducks – Swan.
7. Dieonea – Drosera – Elodea – Halophila.
8. Extinction – Aestivation – Hibernation – Camouflage.
9. Frogs – Jerboa – Reptiles.
10. Desert snail – Jerboa – Toads.

16. Compare between each of the following :

1. The limbs of a horse and the limbs of a camel.
2. Functional and anatomical adaptations (mention an example).
3. Behavioural and functional adaptations (mention an example).
4. Whales and bats (concerning : the modification of front limbs – the reason of modification).
5. Predatory birds and ducks (concerning : the modification of beaks and legs – the reason of modification).
6. The birds that feed on mosses and birds that feed on aquatic snails and worms.
7. Frogs and desert snail [concerning : the type of adaptation – the feature of adaptation – the reason of adaptation].
8. Aestivation and hibernation [concerning : time of occurrence – purpose – how does it take place and an example for each].

17. What are the results based on ... ?

1. The variety of ways of motion in mammals.
2. The variety of food for birds.
3. Living of mammals in varied environments.
4. Stick insect looks like the branches of plants.

18. Mention :

1. The types of adaptation and an example of each one.
2. The reasons for adaptation.
3. The ways of movement of mammals.
4. Three forms of adaptation in living organisms with the environmental changes.

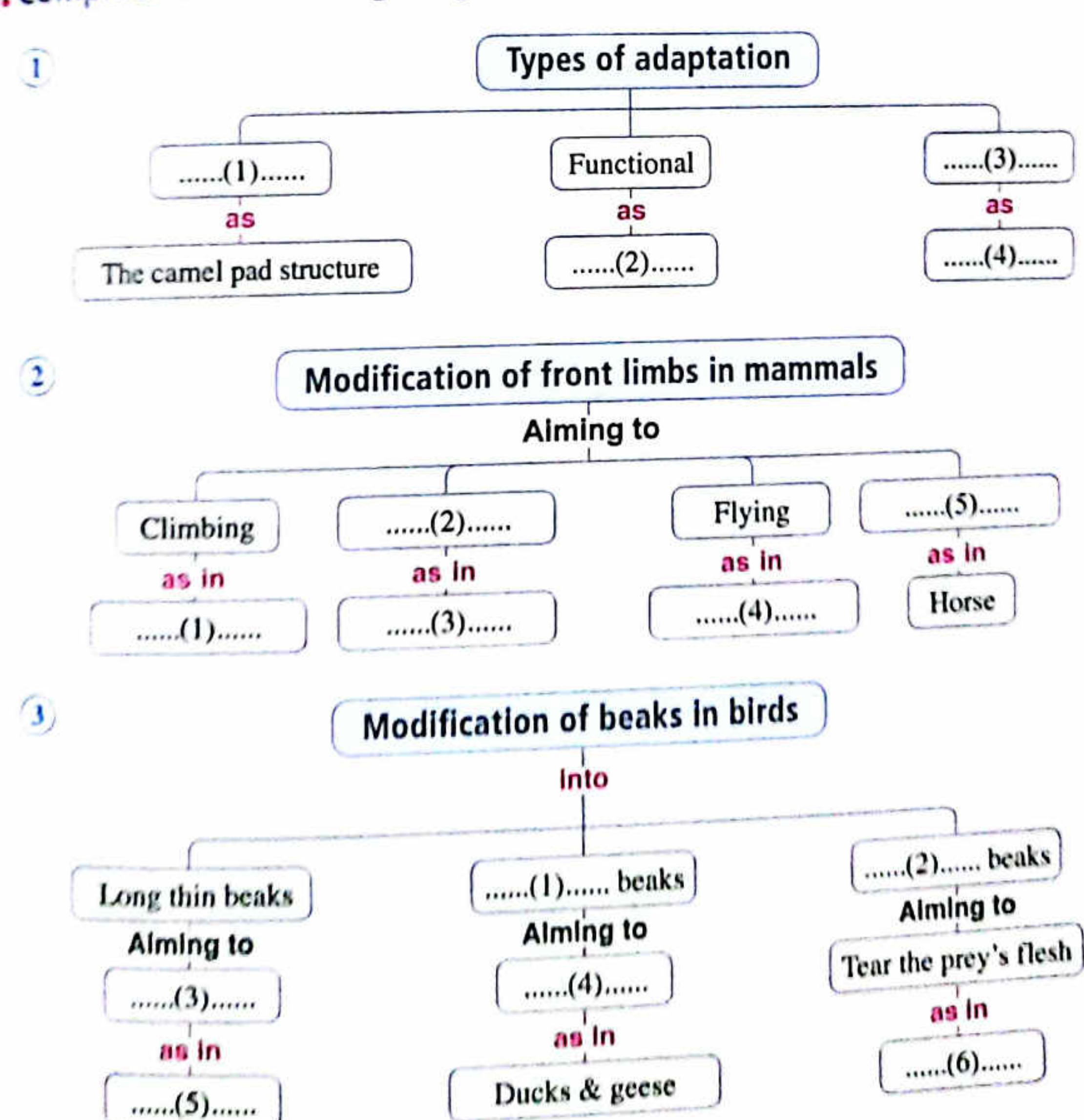
19. How can the following organisms be adapted to overcome the given environmental conditions ... ?

1. Stick insect to hide from its enemies.
2. Desert snail to overcome the increase in temperature in summer.
3. Leaf insect to hide from its enemies.
4. Quail bird to overcome the decrease in temperature in winter.
5. Chameleon to capture its preys.

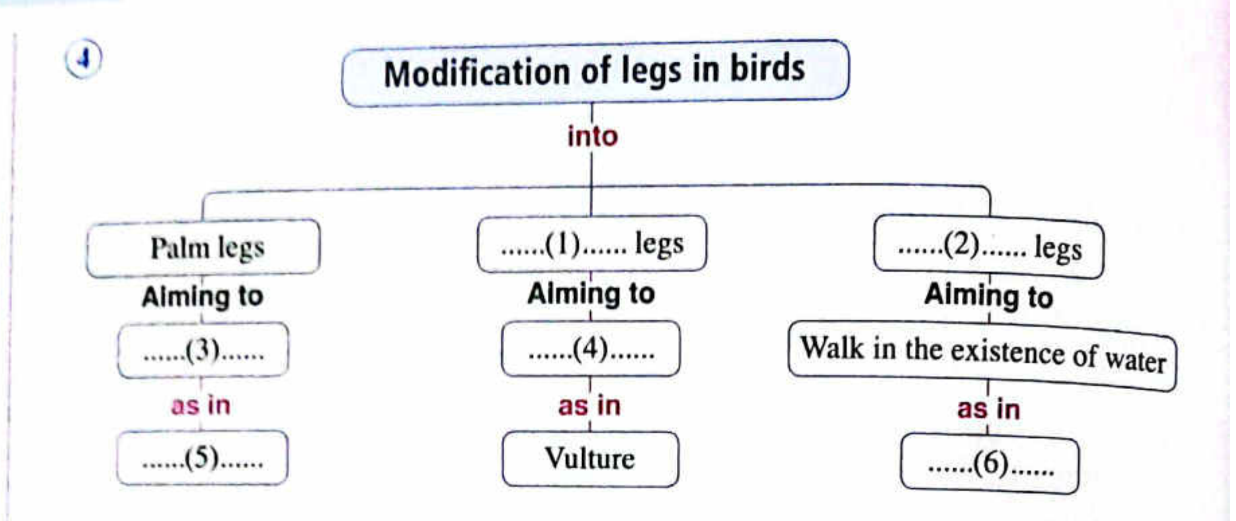
20. Migration is considered as a form of adaptation in birds, answer the following questions :

1. Why do some types of birds tend to migrate ?
2. What is the type of this adaptation ?
3. Give an example of these birds.

21. Complete the following diagrams :



4



22. Study the following figures, then answer the following questions :

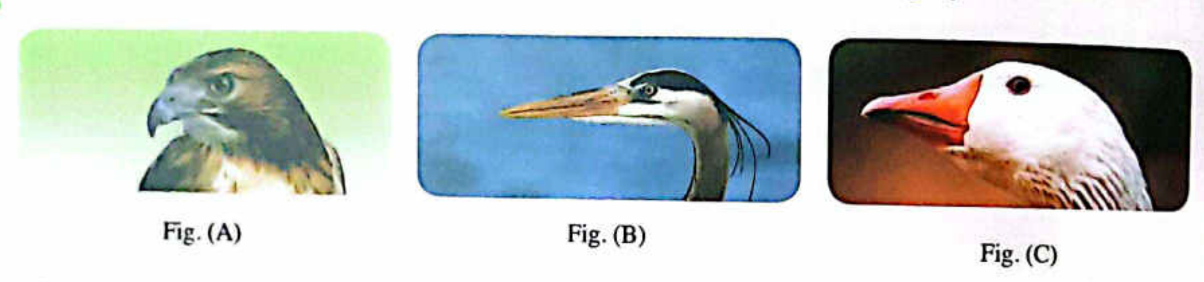


Fig. (A) Fig. (B) Fig. (C)

1. Mention an example of a bird which has the beak of figure (A) and (C).
2. What is the adaptation that takes place in each figure to perform its function ?
3. Mention the kind of food which suits fig. (B) and fig. (C).
4. What are the expected shapes of legs of birds that have these beaks ?



Thinking Skills Questions

1. Study the following figures, then answer the following questions :

1. Notice the external features of the opposite birds, **then answer :**
   a. Mention the differences between them.
   b. Mention the kind of food which suits each of them.


Fig. (1)


Fig. (2)

2. The following figures represent the legs of a group of birds, **answer the following questions :**


Fig. (1)


Fig. (2)


Fig. (3)

   a. What are the expected shapes of beaks of birds that have these legs ?
   b. Is the bird that has the leg in fig. (1) swim in water ? Explain.

3. Mention the names of the following living organisms, then mention the modifications that happen in each of them according to what you have studied.


Fig. (1)


Fig. (2)


Fig. (3)

2. **Your colleague told you that he had seen some plants capture insects. According to your classmate story, answer the following questions :**

a. What is the reason for capturing these plants for insects ?

b. Are these plants autotrophic or no ? And why ?

c. Mention three examples of these plants.

d. What is the type of adaptation in the leaves of these plants ?

3. **During watching a TV show, Sara saw a snake secretes poison to hunt an animal in the forest, bats fly numerously at night and a monkey climb the trees by helping of its elongated limbs. According to the previous story, answer the following questions :**

a. What is the type of adaptation that happened in the three animals ?

b. Mention the modifications that happened in the limbs of bat and monkey to cope with the environmental conditions where they live in.

Project
On UNIT THREE



A project to develop the mental organization
"Determining the different object in a certain group"

Circle the different living organism in each group and give the reason for the difference.

Reason for difference	Groups of living organisms
....	
....	
....	
....	
....	

Glossary



Unit 1

Lesson 1

Matter	مادة
Mass	كتلة
Occupy	تشغل
Space	فراغ
Volume	حجم
Physical	فيزيائية
Differentiate	نميز - نفرق
Among	بين
Copper	نحاس
Silver	فضة
Gold	ذهب
Vinegar	خل
Flour	دقيق
Table salt	ملح الطعام
Colourless	عديم اللون
Tasteless	عديم الطعم
Odourless	عديم الرائحة
Density	كثافة
Melting (Fusion) point	نقطة الانصهار
Boiling point	نقطة الغليان
Thermal	حرارى
Conductivity	توصيل
Float	يطفو
Sink	يغوص
Cubic	مكعب
Cork	فلين
Nail	مسمار
Ratio	نسبة
Extinguish (put out)	إطفاء
Flag	علم
Festival	احتفال
Purity	نقاء
Evidence	دليل
Fusion	انصهار
Wax	شمع
Butter	زبدة
Sulphur	كبريت
Alloy	سبيكة
Cooking pan	إناء الطهى
Rubber	مطاط
Conductor	موصل
Insulator	عازل
Luster	بريق (لامع)
Rust	صدأ
Corrosion	تآكل

Lesson 2

Construction	تركيب
Building unit	وحدة بناء
Naked eye	العين المجردة
Cell	خلية
Molecule	جزئ
State of continuous motion	حالة حركة مستمرة
Intermolecular spaces	مسافات جزيئية
Intermolecular forces	قوى ترابط جزيئية
Overcome	تتغلب
Vibrational motion	حركة إهتزازية
Definite	محدد
Indefinite	غير محدد
Atom	ذرة
Fundamental	أساسى
Melting process	عملية الإنصهار
Vaporization process	عملية التبخير
Latent heat of melting	الحرارة الكامنة للإنصهار
Latent heat of vaporization	الحرارة الكامنة للتبخير
Analyse	حلل
Mercury	زئبق
Noble gases	غازات نبيلة
Monoatomic	احادى الذرة
Diatomic	ثنائى الذرة
Compound	مركب
Identical	متماثل

Lesson 3

Symbol	رمز
Proton	بروتون
Neutron	نيوترون
Electron	إلكترون
Concentrated	مركزه
Orbit	يدور
Energy levels	مستويات الطاقة

Negligible	مهملة
Ordinary state	حالة عادية
Neutral	متعادل
Mass number	العدد الكتلى
Atomic number	العدد الذرى
Cloud	سحابة
Imaginary	وهمى
Heaviest	اثقل
Outermost	خارجى
Excited	مثار
Quantum	كم (كوانتم)
Configuration	توزيع
Unstable	غير مستقر
Active	نشط
Inert gases	غازات خاملة

Unit 2

Lesson 1

Energy	طاقة
Fuel	وقود
Resources	موارد
Sources	مصادر
Forms	صور
Operate	يُشغل
Equipment	أجهزة / معدات
Machines	آلات
Car engine	محرك السيارة
Body activities	أنشطة الجسم
Work	شغل
Displacement	إزاحة
Distance	مسافة
Mechanical energy	طاقة ميكانيكية
Potential energy	طاقة وضع
Kinetic energy	طاقة حركة
Stretched spring	زنبرك مشدود
Electric energy	طاقة كهربية
Electric generator	مولد كهربائى
Solar cell	خلية شمسية
Sound energy	طاقة صوتية
Light energy	طاقة ضوئية
Kerosene lamp	مصباح زيتى
Chemical energy	طاقة كيميائية
Stored energy	طاقة مختزنة
Car battery	بطارية السيارة
Solar energy	طاقة شمسية
Heat (thermal) energy	طاقة حرارية
Electric heater	سخان كهربائى
Oven	فرن
Nuclear energy	طاقة نووية
Permanent resource	مورد دائم
Wind	رياح
Renewable resource	مورد متجدد
Chemical reactions	تفاعلات كيميائية
Non-renewable resource	مورد غير متجدد
Waterfalls	مساقط (شلالات) المياه
Nuclear reactions	تفاعلات نووية
Countries	بلاد
Generating electricity	توليد الكهرباء
Cheap sources	مصادر رخيصة
Pollute	يُلوث
The environment	البيئة
Sum	مجموع
Constant value	قيمة ثابتة
Moving body	جسم متحرك
Raise	ارفع
Hit	يضرب
Falls down	سقط لأسفل
Convert (change)	تحول
Highest point	أعلى نقطة
Weight	الوزن
Height	الارتفاع
Directly proportional	تناسب طردى
Repeat	كرر
Mass	كتلة
Square of the speed	مربع السرعة

Lesson 2

Transformation	تحول
Running	جرى
Electric fan	مروحة كهربائية
Mixer	خلاط
Conservation of mechanical energy	بقاء الطاقة الميكانيكية
Vibrating body	جسم مهتز
Simple pendulum	بندول بسيط
Rest position	موضع السكون

Maximum height	اعلى ارتفاع
Alternates	تتبادل
Gradually	تدريجيًا
Throw	يلقى
Earth's gravity acceleration	عجلة الجاذبية الأرضية
Created	تستحدث (تخلق)
Destroyed	تفنى
Simple electric cell	عمود كهربائى بسيط
Compass	بوصلة
Dip	اغرس
Press	اضغط
Zinc plate	شريحة خارصين
Deflect	انحراف
Electric current	تيار كهربى
Deaf person	شخص أصم (فاقد حاسة السمع)
Blind person	شخص كفيف (فاقد حاسة البصر)
Car lamps	مصابيح السيارة
Technological applications	تطبيقات تكنولوجية
Sewing machine	ماكينة حياكة
Washing machine	غسالة
Car exhausts	عوادم السيارة
Military explosions	التفجيرات العسكرية
Chemical pesticides	المبيدات الكيميائية
Nuclear weapons	الاسلحة النووية
Massive destruction	تدمير شامل
Electromagnetic pollution	تلوث كهرومغناطيسى
Networks	شبكات
Cellular phone	التليفون المحمول

Lesson 3

Mixture	خليط
Higher temperature	درجة حرارة مرتفعة
Lower temperature	درجة حرارة منخفضة
Friction	احتكاك
Invert	اقلب
Tire	إطار
Movement of particles	حركة الجزيئات
Transfer of heat	انتقال الحرارة
Methods (ways)	طرق
Nut fastener	صامولة
Different media	أوساط مختلفة
Conduction	توصيل
Convection	حمل
Radiation	إشعاع
Metallic spoon	ملعقة معدنية
Expand	تمدد
Air conditioner	التكييف
Refrigerator	الثلاجة
Photosynthesis process	عملية البناء الضوئى

Unit 3

Lesson 1

Diversity	تنوع
Adaptation	تكيف
Living organisms	كائنات حية
Rhinoceros	الخرتيت
Lizard	سحلية
Crocodile	تمساح
Hippopotami	سبع البحر
Variety	تنوع
Huge	ضخم
Camphor	الكافور
Palm	نخيل
Herbs	أعشاب
Clover	برسيم
Micro-organisms	كائنات دقيقة
Stagnant pond water	ماء بركة راكدة
Objective lens	عدسة شيئية
Sample	عينة
Unicellular organism	كائن وحيد الخلية
Amoeba	الأميبا
Euglena	يوجلينا
Paramecium	براميسيوم
Enormous	كبير جدًا/هائل
External shape	الشكل الخارجى
Algae	طحالب
Reproduction	تكاثر
Formation	تكوين
Spores	جراثيم
Seeds	بذور
Terrestrial plants	نباتات أرضية
Ferns	سراخس
Vougheir plant	نبات الفوجير

Adiantum plant	نبات كزبرة البئر
Gymnosperms	معراة البذور
Cones	مخاريط
Pericarp (Fruit envelope)	غلاف ثمري
Pine	الصنوبر
Cycas plant	نبات السيكس
Angiosperms	مغطاة البذور
Monocotyledon plants	نباتات ذات فلقة واحدة
Dicotyledon plants	نباتات ذات فلقتين
Supporting	تدعيم
Soft body	جسم رخو
Supported body	جسم مدعم
External support	دعامة خارجية
Internal support	دعامة داخلية
Jellyfish	قنديل البحر
Octopus	الأخطبوط
Worms	ديدان
Mussels	المحار
Snails	قواقع
Crustacea	قشريات
Vertebrates	الفقاريات
Reptiles	زواحف
Mammals	ثدييات
Invertebrate	لافقارى
Arthropods	المفصليات
Jointed legs	أرجل مفصلية
Locust	جرادة
Bee	نحلة
Fly	ذبابة
Cockroach	صرصور
Ant	نملة
Spider	عنكبوت
Scorpion	عقرب
Arachnids	عنكبوتيات
Myriapods	عديدة الأرجل
Scolopendra	أم ٤٤
Julius	ذات الألف قدم
Edentates	عديمة الأسنان
Sloth	الكسلان
Armadillo	المدرع
Hedgehog	القنفذ
Capture	يصطاد
Insects	حشرات

Pointed canines	أنياب مدببة
Molars with sharp projections	ضروس لها نتوءات حادة
Sharp incisors	قواطع حادة
Jaw	فك
Rodents	قوارض
Squirrel	سنجاب
Lagomorphs	أرنبيات
Taxonomy	علم تصنيف الكائنات الحية
Facilitate	يُسهل
Species	النوع
Offspring	نسل
Mate (Intercourse)	تزاوج
Sterile	عقيم
Mule	بغل

Lesson 2

Climate	مناخ
Modification	تحور
Behaviour	سلوك
Structural (anatomical) adaptation	تكيف تركيبى
Functional adaptation	تكيف وظيفى
Behavioural adaptation	تكيف سلوكى
Camel pad	خف الجمل
Horse hoof	حافر الحصان
Secretion	إفراز
Sweat	عرق
Poison	سم
Birds migration	هجرة الطيور
Obtaining	حصول
Escaping	هروب
Enemies	أعداء
Climb	يتسلق
Limbs	أطراف
Front limbs	الأطراف الأمامية
Paddles	مجاديف
Wings	أجنحة
Elongated fingers	أصابع طويلة
Beaks	مناقير
Legs	أرجل
Predatory birds	طيور جارحة
Hawk	الصقر
Vultures	النسور

Crooked beaks	مناقير ملتوية
Tear	تمزيق
Prey's flesh	لحم الفريسة
Claws	مخالب
Anterior	أمامية
Posterior	خلفية
Shallow water	مياه ضحلة
Heron	أبو قردان
Hoopoe	هدهد
Mosses	طحالب
Insectivorous (insect-eating)	آكلات الحشرات
Autotrophic	ذاتية التغذية
Dieonea plant	نبات الدايونيا
Drosera plant	نبات الدروسيرا
Halophila	حامول الماء
Hibernation	البيات الشتوى
Burrows	جحور
Bury	تدفن
Mud	طين
Overcome	تتغلب على
Frogs	ضفادع

Toad	ضفدع البر
Aestivation	خمول صيفى
Desert areas	مساحات صحراوية
Extreme	شديد
Shortage	نقص
Dormancy	سكون
Hide	يختفى
Humid burrows	جحور رطبة
Constancy	ثبات
Jerboa	اليربوع
Desert snail	قوقع الصحراء
Quail bird	طائر السمان
Habitat	الموطن الأصلى
Hiding	تخفى
Camouflage	التمويه
Preys	الفرائس
Predatory species	الأنواع المفترسة
Stick insect	حشرة العود
Leaf insect	الحشرة الورقية
Chameleon	حرباء
Dominant	سائدة

SCIENCE

NOTEBOOK

2023

FIRST TERM

BY A GROUP OF SUPERVISORS

- Worksheets
- Final Revision
- Final Examinations

1st prep.

EL-MOASSER SERIES





Matter and its Characteristics

Worksheet 1

1. Complete the following :

1. We can distinguish between ammonia and perfume by their different ....
2. .... and .... can float on water surface, while .... and .... can sink in water.
3. Density is .... of unit volume of the substance and its measuring unit is .... *(El-Agamy / Alex. 2022)*
4. .... is the measuring unit of mass, while .... is the measuring unit of volume. *(St. Joseph Sch. / Cairo 2020)*
5. .... , ... and .... are from the physical properties of matter.

2. Choose the correct answer :

1. The volume of the liquid is calculated from the relation ....
   a. $\frac{\text{mass}}{\text{density}}$ b. $\frac{\text{density}}{\text{mass}}$ c. mass × density. d. mass + density.
2. If you know that the density of water is 1 gm/cm^3, so the volume of 10 gm of water is ....
   a. 5 cm^3. b. 10 cm^3. c. 20 cm^3. d. 40 cm^3.
3. The taste property is the distinguishing factor between ....
   a. milk and honey. b. wood and plastic.
   c. silver and gold. d. oxygen and nitrogen.
4. The density of helium is .... that of air.
   a. less than b. more than c. equal to d. double
5. If the following shapes have the same mass. Which of them has the smallest density ?
   Fig. ....

a. b. c. d.

3. Give reasons for :

1. Equal volumes of different substances have different masses.

....

(Egypt Dream Sch. / Giza 2020)

2. An iron nail sinks in water, while one kilogram of cork floats on water surface. *(North Giza / Giza 2022)*

....

....

3. Water isn't used to put out petrol fires. *(Taymour Sch. / Alex. 2022, Egypt Dream Sch. / Giza 2020)*

....

....

4. **A. Complete the following table :** *(East Zone / Alex. 2020)*

Substance	Mass (gm)	Volume (cm^3)	Density (gm/cm^3)
(A)	22	..........(1)..........	2
(B)	5	20	..........(2)..........
(C)	..........(3)..........	15	1

B. The following figures represent three balls of the same volume and mass. They are put in three beakers containing different liquids :

(a) (b) (c)

1. If the balls have the same volume and mass, while the liquids have the different densities. Arrange the liquids in an ascending order according to their densities.

....

2. If the balls are made of different materials and they are all placed in the same liquid, Arrange the balls in an ascending order according to their densities.

....

5. **Problems :**

1. When a piece of iron of mass 78 gm is put in a graduated cylinder containing 100 cm^3 of water, the reading of the cylinder becomes 110 cm^3. *(Futures Sch. / Cairo 2020)*

Calculate the density of the piece of iron.

....

....

2. When five similar copper pieces are put in a graduated jar containing 60 cm^3 of water, the level of water reaches 75 cm^3. If the density of copper is 8.8 gm/cm^3.

Find the mass of each piece.

....

....

....

3. In an experiment to determine the density of a liquid, the following results are recorded :
   - The mass of an empty cylinder = 56 gm.
   - The mass of the cylinder containing liquid = 156 gm. *(El-Agami Zone / Alex. 2020)*
   - The volume of the liquid = 100 cm^3.

   Calculate the density of the liquid.

   ....

   ....

4. If the mass of an empty graduated cylinder is 20 gm, its mass when it is filled completely with water is 30 gm and its mass when it is filled completely with unknown liquid is 27 gm. **Calculate the density of this unknown liquid.** (Density of water is 1 gm/cm^3).

   ....

   ....

Worksheet 2

1. What is meant by ... ?

1. Melting point : ....

   ....

   (East Zone / Alex. 2020)

2. Boiling point : ....

   ....

2. Complete the following :

1. .... and .... are from the substances which have low melting points, while .... and .... are from the substances which have high melting points.
2. Separation of petroleum components depends on the difference in their ....
3. .... is one of the solid substances which appears soft at room temperature, while .... is a solid substance which doesn't soften by heating.
4. An alloy of .... is used in making jewels, while an alloy of .... is used in making heating coils. *(Leaders Sch. / Cairo 2022, Lycee Bab El-Louk Sch. / Cairo 2020)*

3. Give reasons for :

1. Cooking pans are made up of aluminium or stainless steel. *(Orman College Sch. / Giza 2020)*

   ....

2. A piece of ice melts when it is left in air.

   ....

3. Iron rods are used in building concrete houses, but copper rods are not used.

   ....

   (St. Joseph Sch. / Cairo 2022 / Manaret Heliopolis Sch. / Cairo 2020)

4. What is meant by ... ?

1. The melting point of ice = 0°C : ....

2. The boiling point of water = 100°C : ....

(St. Joseph Sch. / Cairo 2022)

Worksheet 3

1. Mention an example for :

1. A substance has low melting point. *(Menofia 2020)* (..........................)
2. A very active metal. *(St.Mark Sch. / Minia 2022, Manaret Heliopolis Sch. / Cairo 2020)* (..........................)
3. A substance used to plate iron. (..........................)
4. An inactive metal. (..........................)

2. Study the following figures, then answer the following question :

Fig. (1) Fig. (2)

In which figure does the lamp illuminate ? Why ?

....

3. Complete the following sentences :

1. .... , ... and gold are .... metals , so they are used in making jewels.
2. .... and .... solutions are good conductors of electricity, while .... and .... solutions are bad conductors of electricity.
(El-Manahel Private Sch. / Sohag 2022, Qus official Sch. / Qena 2020)
3. Electric wires are made up of .... or .... as they are .... conductors of electricity. *(Port Said 2020)*
4. Light posts in streets are painted from time to time in order to protect them from .... *(Port Said 2020)*

4. Give reasons for :

1. An electrician uses a screwdriver made up of a steel iron with a plastic handle.
....
....
(Al-Manar Sch. / Ismailia 2020)
2. Aluminium cooking pans are washed with a rough material.
....
....



Matter Construction

Worksheet 4

1. What happens when ... ? Why ?

1. Open a bottle of perfume in a closed room for a while. *(St. Joseph Sch. / Cairo 2022)*

....

....

2. Add 100 cm^3 of water to 50 cm^3 of ethyl alcohol.

(Taymour Sch. / Alex. 2022, Orman College Sch. / Giza 2020)

....

....

3. Try to break an iron piece with your hand.

....

....

2. Complete the following :

1. Matter consists of small building units called .... *(Cairo 2020)*
2. Gases are characterized by large .... and very weak .... , so they have .... shapes and volumes. *(Manaret Heliopolis Sch. / Cairo 2020)*
3. .... take the shape of the container, while .... have no definite shape. *(Beni Suef 2020)*

3. Give reasons for :

1. A drop of ink spreads through water.

....

....

2. Solids have definite shapes and volumes. *(Alfarouk Islamic Sch. / Cairo 2022)*

....

....

....

3. It is easy to divide an amount of water into smaller parts. *(Orman College Sch. / Giza 2020)*

....

4. What is meant by the molecule ? Mention the properties of the molecules of matter.

....

....

....

....

....

Worksheet 5

1. A. Give reasons for :

1. Heat changes the matter from the solid state into the liquid state.

....

....

....

2. When water gains energy, it converts into gas.

....

....

....

B. Complete the following :

1. During vaporization process, liquid molecules .... energy and change into .... molecules.
2. The attraction force between molecules of .... is very strong and almost not exist in ....

2. A. Put (✓) or (✗) :

1. The attraction force among molecules of solids are very weak. *(El-Salam Sch. / Luxor 2020)* (   )
2. The motion of the molecules of gas is limited. (   )
3. The intermolecular spaces among the molecules of gaseous matter are small. (   )

B. What is meant by ... ?

1. Melting process : ....

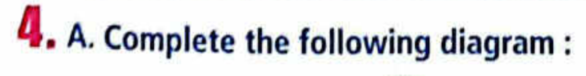
....

2. Vaporization process : ....

....

3. Complete the following table :

Points of comparison	Solid state	Liquid state	Gaseous state
1. Motion of molecules :	....	More free	....
2. Intermolecular spaces :	....	....	....
3. Intermolecular forces :	....	Intermediate	....
4. Volume :	Definite	....	Indefinite
5. Shape :	....	....	Indefinite
6. Example :	....	....	....



4. A. Complete the following diagram : *(St. Joseph Sch. / Cairo 2022)*



B. What happens when you ...?

Heat some water in a beaker to its boiling point. *(El-Agamy / Alex. 2022)*

....

Worksheet 6

1. A. Write the scientific term for each of the following :

1. The simplest pure form of matter which can't be analyzed chemically into simpler form. *(Lycee Bab El-Louk Sch. / Cairo 2020)* (..........................)
2. A substance which is formed from combination of atoms of two or more different elements with constant weight ratios. *(Menofia 2020)* (..........................)
3. A molecule which is formed of similar atoms. (..........................)
4. A compound which is formed of two hydrogen atoms and one oxygen atom. *(West Mansoura Zone / Dakahlia 2020)* (..........................)

B. Choose the odd word out, then write the scientific term for others :

1. Neon – Argon – Oxygen – Xenon. *(Alfarouk Islamic Sch. / Cairo 2022)*
2. Oxygen – Nitrogen – Water – Chlorine.
3. Ammonia – Water – Hydrogen chloride – Aluminium. *(Leaders Sch. / Cairo 2022)*

Odd word	Scientific term
1.	....
2.	....
3.	....

2. Choose the correct answer :

1. All of the following molecules are composed of one atom except ....
   a. argon. b. mercury. c. bromine. d. krypton.
2. Which of the following figures represents the molecule of hydrogen chloride ? ....


a.

b.

c.

d.

3. The molecule of ammonia consists of ....
   a. two atoms of two elements. b. two atoms of three elements.
   c. three atoms of three elements. d. four atoms of two elements.
4. All of the following are compounds molecules except ....
   a. water. b. ammonia.
   c. hydrogen chloride. d. fluorine.

5. All of the following are noble gases except ....

a. hydrogen. b. neon. c. xenon. d. argon.

3. A. Put (✓) or (✗), then correct the wrong one :

1. Oxygen element is a gaseous diatomic molecule.
   ( ) ....
2. The molecules of the same substance are different from each other.
   (Al-Mostaqbal Sch. / Aswan 2020)
   ( ) ....
3. Hydrogen chloride is an element, while sulphur is a compound.
   ( ) ....
4. The compound consists of combination of atoms of one element.
   ( ) ....

B. What is the difference between O_2 & O ?

O_2	O
....	....
....	....

4. A. Complete the following :

1. Hydrogen molecule is composed of .... atom(s), while argon molecule is composed of .... atom(s). *(Al-Ola Sch. / Cairo 2022)*
2. The liquid element which consists of one atom is .... , while that consists of two atoms is ....
   (Manarat El-Eman Sch. / Cairo 2022, Lycee Bab El-Louk Sch. / Cairo 2020)
3. Molecules of active gases are formed of .... atom(s), while molecules of inert gases are formed of .... atom(s).

B. Compare between element and compound concerning :

Definition – Atoms – Examples.

Points of comparison	Element	Compound
• Definition :	....	....
• Atoms :	....	....
• Examples :	....	....

Worksheet  on Lessons One & Two Unit 1

1. Choose the correct answer :

1. Liquid elements are .... *(Ramses College Sch. / Cairo 2020)*

   a. all monoatomic. b. either monoatomic or diatomic.

   c. monoatomic, diatomic or triatomic. d. all diatomic.

2. All of the following are physical properties of matter except ....

   a. density. b. colour. c. taste. d. reaction with oxygen.

3. The mass of the liquid is calculated from the relation..............

   a. density × volume. b. $\frac{\text{density}}{\text{volume}}$

   c. $\frac{\text{volume}}{\text{density}}$ d. density + volume.

4. The smallest part of matter which can exist freely is ....

   a. atom. b. compound.

   c. element. d. molecule. *(West Mansoura Zone / Dakahlia 2020)*

5. Four different liquids were put in a graduated cylinder as in the figure, when they have equal volumes, which one has the biggest mass ? ....

   P
   Q
   R
   S

   a. P b. Q c. R d. S

   (Sharm El-Sheikh Zone / South Sinai 2020)

2. A. Put (✓) or (✗), then correct the wrong ones :

1. Equal volumes of different substances have the same masses.

   ( ) ....

2. Mass is the space that is occupied by the body.

   ( ) ....

3. The intermolecular spaces bind the molecules of matter together.

   ( ) ....

B. What is meant by ... ?

1. The mass : ....

2. The molecule : ....

....

3. A. Complete the following :

1. Balloons are filled with .... or .... rise up in the air.
2. Alkaline solutions are .... of electricity , while solution of hydrogen chloride in benzene is a .... of electricity. (West Mansoura Zone - Dakahlia 2020)
3. .... is the liquid element which is composed of one atom , while .... is the liquid element which is composed of two atoms.

(East Tanta - Gharbia 2022 - Sohag 2020)

B. Give reasons for :

1. Although sugar and table salt have the same shape and colour , we can differentiate between them easily.

....

2. Ammonia is a compound molecule.

....

4. A. What happens if you ... ?

Put a small quantity of potassium permanganate in a glass beaker containing water.

....

(Futures Sch. - Cairo 2020)

B. Liquid (A) has a mass of 27 gm and a volume of 30 cm^3, while liquid (B) has a mass of 45 gm and a volume of 40 cm^3 (Ramses College Sch. - Cairo 2020)

1. Find the density of each liquid.

....

....

2. If you pour the two liquids into the same container, which liquid will be at the bottom ? and why ?

....

....



Atomic Structure of Matter

Worksheet 8

1. A. Write the scientific term for each of the following :

1. An electrically neutral particle inside the nucleus of an atom. (..........................)
2. The number of positively protons in the nucleus.
(Al-Ola Sch. / Cairo 2022, St. Joseph Sch. / Cairo 2020) (..........................)
3. The fundamental building unit of matter.
(Akhnaton Sch. / Cairo 2020) (..........................)
4. The sum of the numbers of protons and neutrons in the nucleus.
(6^{th} October / Giza 2022, Manaret Heliopolis Sch. / Cairo 2020) (..........................)

B. Write the symbol of each of the following elements :

Element	Its symbol	Element	Its symbol
1. Copper	....	9. Nitrogen	....
2. Chlorine	....	10. Silicon	....
3. Aluminium	....	11. Silver	....
4. Carbon	....	12. Iron	....
5. Mercury	....	13. Gold	....
6. Calcium	....	14. Potassium	....
7. Sodium	....	15. Lead	....
8. Magnesium	....	16. Zinc	....

2. Give reasons for :

1. The nucleus of an atom is positively charged.
(Manaret El-Eman Sch. / Cairo 2022, Sharm El-Sheikh Zone / South Sinai 2020)
....
....
2. The mass number is usually greater than the atomic number.
(Modern Normer Sch. / Giza 2022, Gharbia 2020)
....
....
3. The symbol of potassium is (K) not (Po) as it is expected.
....
....

3. **A. If the mass number of sodium atom is 23 and its atomic number is 11, so :**

1. The number of protons is ....
2. The number of neutrons is ....

B. What happens when the number of protons changes ? *(Sohag 2020)*

....

....

4. **Mention the difference between :**

1. Atomic number and mass number :

Atomic no.	Mass no.
....	....
....	....
....	....
....	....

2. Proton and electron :

Proton	Electron
....	....
....	....

Worksheet 9

1. **A. Give reasons for :**

1. The electrons are distributed to fill (K) level before filling (L) level.

....

(West Mansoura Zone / Dakahlia 2020)

2. The mass of the atom is concentrated in the nucleus.

....

3. The atom is electrically neutral in its ordinary state.

(Leaders Sch. / Cairo 2022, El Salam Sch. / Luxor 2020)

....

B. Write the symbol under each energy level to arrange them according to their positions from the nucleus, then mention which of them has the least energy and which of them has the highest energy ?

1. .... level has the least energy.
2. .... level has the highest energy.

Nucleus

....

2. A. Complete the following statements :

1. The electrons revolve around the nucleus at very .... in a number of shells called ....

2. The maximum number of energy levels in the heaviest atoms is ....

B. Write the scientific term :

1. Negatively charged particles of negligible mass that revolve around the nucleus. (........................)

2. The imaginary regions around the nucleus in which the electrons move according to their energies. *(Lycee Bab El-Louk Sch. / Cairo 2020)* (........................)

3. The amount of energy lost or gained by an electron when it transfers from one energy level to another. *(Alfarouk Islamic Sch. / Cairo 2022, Ramses College Sch. / Cairo 2020)* (........................)

3. What happens if ... ?

1. An electron gains a quantum of energy. *(Leader Sch. / Cairo 2022, Port Said 2020)*

....

2. The nucleus of an atom of an element doesn't contain neutrons.

....

(St. Joseph Sch. / Cairo 2020)

3. An excited electron loses a quantum of energy. *(Dream Sch. / Giza 2020)*

....

Worksheet 10

1. Complete the following table :

(Al-Manar Sch. / Ismailia 2020)

Element symbol	Atomic no.	Mass no.	No. of protons	No. of electrons	No. of neutrons	Electronic configuration		
						K	L	M
$^{24}_{12}Mg$	....	24	....	12	....	....	....	....
$^{12}_{6}C$	6	12	6	....	6	....	....	—
$^{35}_{17}Cl$	17	....	17	17	....	....	....	....

2. A. Complete the following statements :

1. The energy level "M" is saturated with .... electrons, while the energy level (N) is saturated with .... electrons according to the rule ($2n^2$).

(Behira 2022, Al-Resala Sch. / Qalyoubia 2020)

2. The number of electrons which saturates the first four energy levels can be calculated from the relation ....

3. The energy level "M" of aluminium atom ($^{27}_{13}Al$) contains .... electrons, while that of sulphur atom ($^{32}_{16}S$) contains .... electrons.

B. Give reasons for :

1. Inert gases can't share in chemical reactions in ordinary state. *(El-Agami Zone / Alex. 2020)*

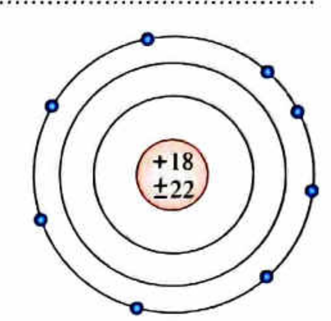
....

2. The rule ($2n^2$) is not applied on the energy levels greater than four.

(Egypt Dream Sch. / Giza 2020)

....

3. A. The opposite figure represents the electronic structure of an atom. Find :



1. The atomic number : ....
2. The mass number : ....
3. The number of electrons : ....
4. The number of neutrons : ....

B. Rewrite the following statements after correcting the underlined words :

1. **Hydrogen** is the only inert gas which contains two electrons in the outermost energy level.

....

2. **Neon ($_{10}Ne$)** is an active element, while **nitrogen ($_7N$)** is an inactive one.

....

4. A. Study the following figures, then complete the following table :

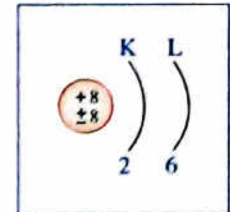


Fig. (A)

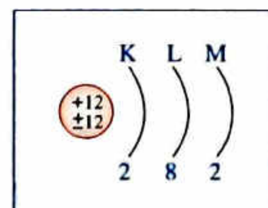


Fig. (B)

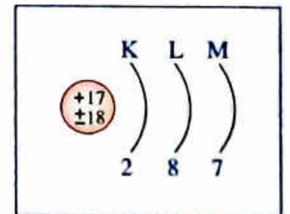


Fig. (C)

Element	Atomic no.	Mass no.	No. of electrons in the outer level	No. of energy levels having electrons
Fig. (A)	....	....	....	....
Fig. (B)	....	....	....	....
Fig. (C)	....	....	....	....

B. Compare between active elements and inactive elements :

Points of comparison	Active elements	Inactive elements
• The electrons in the outer level :	....	....
• Chemical activity :	....	....
• Examples :	....	....

5. A. An element, whose electrons are distributed in three energy levels, and its outermost energy level carries 3 electrons and its atom contains 14 neutrons. Answer the following questions :

1. Show by drawing the electronic distribution of the atom of this element.

2. Calculate the atomic and mass numbers of the atom of this element.

....

3. Is this element active or inert ?

....

B. An atom of an element doesn't take part in any chemical reaction and its electrons are distributed in three energy levels and its atom contains 22 neutrons. Calculate :

1. Atomic number.

....

....

2. Mass number.

....

....

General Exercise of the School Book  on Unit One

1. A. Choose a phrase from column (A) which may match another from column (B) :

(A)	(B)
1. Density measuring unit	a. atomic number.
2. Number of positive protons in the nucleus	b. cm^3.
3. Substances that can conduct heat and electricity	c. mass number.
4. Mass measuring unit	d. copper and iron.
5. Total number of protons and neutrons	e. gm.
6. Bad conductors of heat and electricity	f. gm/cm^3.
7. Volume measuring unit	g. wood and plastic.

B. Write down the scientific term expresses the following statements :

1. The smallest particle of matter which can be freely existed and has the characteristics of its substance. (..........................)
2. The temperature at which a solid substance starts to change into a liquid one. (..........................)
3. A smallest particle which can share in chemical reactions. (..........................)
4. Imaginary places in which electrons can move according to their energy. (..........................)
5. The simplest form of matter which can't be decomposed into a simpler one. (..........................)

2. Give reasons for :

1. It is difficult to bend an iron rod.

....

....

2. The third energy level in the atom is saturated by 18 electrons.

....

....

3. Some table salt disappears after a while when added to water without stirring.

....

....

4. Atom is electrically neutral.

....

....

5. Substances have different chemical properties.

....

....

6. Inert gases can't share in chemical reactions in ordinary conditions.

....

....

3. A. Write down the electronic configuration of the following atoms :

$^{27}_{13}Al - ^{20}_{10}Ne - ^{7}_{3}Li - ^{32}_{16}S$

Then determine each of :

Atomic number – Number of neutrons – Mass number – Number of electrons.

Atom	Electronic configuration			Atomic no.	No. of neutrons	Mass no.	No. of electrons
	K	L	M				
$^{27}_{13}Al$	....	....	....	....	....	....	....
$^{20}_{10}Ne$	....	....	....	....	....	....	....
$^{7}_{3}Li$	....	....	....	....	....	....	....
$^{32}_{16}S$	....	....	....	....	....	....	....

B. Write down the formula by which you can find each of the following :

1. Density : ....

2. The number of electrons that saturates the energy level of an atom :

....

Model Exams on Unit 1

Model Exam 1

56

Answer the following questions :

Question 1 — 14 marks

A Complete the following :

1. Matter consists of small building units called ...., which consist of smaller building units called .... *(St. Mark Sch. / Minia 2022, Al-Manar Sch. / Ismailia 2020)*
2. .... and .... are found in the nucleus. *(North Giza / Giza 2022)*
3. Monoatomic means that the molecule is formed of .... atom(s), while diatomic means that the molecule is formed of .... atom(s).
4. The rods used in building concrete houses are made up of ...., while .... is used in making heating coils.

B Write the scientific term of each of the following :

1. The temperature at which a substance begins to change from the liquid state to the gaseous state. *(Mokatam Sch. / Cairo 2022, Futures Sch. / Cairo 2020)* (..........................)
2. The atom that gains a quantum of energy. *(Al Qalyoubia 2022, Thebes Sch. / Giza 2020)* (..........................)
3. The forces that binds the molecules of mater together. *(Manaret Heliopolis Sch. / Cairo 2020)* (..........................)
4. The number of negative electrons that rotate around the nucleus. (..........................)

C Give a reason for :

The atomic number of calcium atom equals 20

....

....

Question 2 — 14 marks

A Put (✓) or (✗), then correct the wrong ones :

1. The energy of level (N) is less than that of level (M).
   ( ) ....
2. The electron transfers from its energy level to a higher energy level when it loses a quantum of energy.
   ( ) ....
3. Aluminium is a very active metal.
   ( ) ....
4. Mercury is a liquid diatomic element.
   ( ) ....

B Choose from column (B) what suits it in column (A) : *(Lycee Bab El-Louk Sch. / Cairo 2020)*

(A)	(B)
1. Density measuring unit.	a. gm/cm^3.
2. Bad conductors of heat and electricity.	b. cm^3.
3. Good conductors of heat and electricity.	c. cm^2.
4. Volume measuring unit.	d. copper and iron.
	e. wood and plastic.

1. .... 2. .... 3. .... 4. ....

C What is meant by ... ?

The density of aluminium equals 2.7 gm/cm^3.

....

....

Question 3 14 marks

A Complete the following table :

The molecule	Its type	Number and type of atoms
Water molecule :	.... (1)	.... (2) ....
.... (3)	.... (4)	Two atoms of oxygen.
Hydrogen chloride molecule :	.... (5)	.... (6) ....
Ammonia molecule :	.... (7)	.... (8) ....

B Choose the correct answer :

1. The smell property is a distinguishing factor between .... *(Futures Sch. / Cairo 2020)*
   a. wood and plastic. b. vinegar and perfume.
   c. silver and gold. d. iron and copper.
2. .... gas is used in filling balloons of celebrations. *(St. Joseph Sch. / Cairo 2020)*
   a. Oxygen b. Nitrogen c. Helium d. Carbon dioxide
3. If the nucleus of an atom contains 11 protons and 12 neutrons, so its mass number is .... *(Akhnaton Egyption Sch. / Cairo 2020)*
   a. 11 b. 23 c. 1 d. 12
4. Some substances need heat to become soften such as ....
   a. coal. b. iron. c. sulphur. d. rubber.
   (Manaret Heliopolis Sch. / Cairo 2020)

C What happens if ... ?

A substance reaches its boiling point.

....

....

Question 4 14 marks

A The opposite figures represent a sketch of the electronic distribution of two atoms of two elements. Complete the following table :

Find :	Fig. 1	Fig. 2
1. Number of electrons	....	....
2. Atomic number	....	....
3. Mass number	....	....
4. Element name	....	....

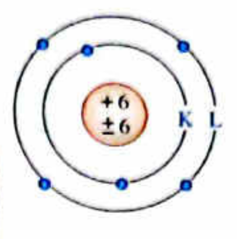


Fig. 1

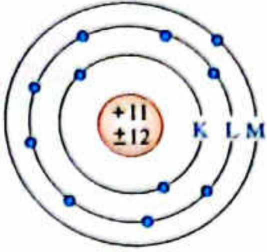
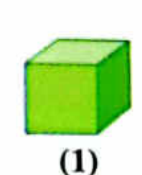
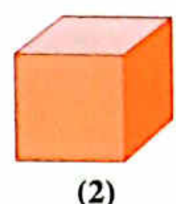
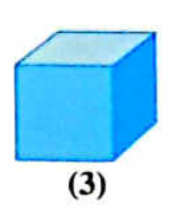


Fig. 2

B Arrange the following cubes ascendingly according to the density. Knowing that they have the same masses.


(1)


(2)


(3)

The arrangement : ....

C What is the density of 35 gm of a substance that occupies 25 cm^3 ?

....

....

(Thebes Sch. / Giza 2020)

Model Exam 2

56

Answer the following questions :

Question 1 14 marks

A Choose the odd word out, then write the scientific name for the rest :

1. Radon – Helium – Nitrogen – Argon.
2. Electron – Angestrom – Proton – Neutron.
3. Fluorine – Ammonia – Bromine – Carbon.
4. Ice – Wood – Oil – Iron nail. *(St. Joseph Sch. / Cairo 2022, St Joseph Sch. / Cairo 2020)*

Odd word	Scientific name
1.	....
2.	....
3.	....
4.	....

B Complete the following diagram :



C Give one difference between :

Hydrogen and helium. *(Manaret El-Eman Sch. / Cairo 2022, El-Agami Zone / Alex. 2020)*

....

....

Question 2 — 14 marks

A Choose the correct answer :

1. The mass of the atom is concentrated in the ....
   a. protons. b. nucleus. c. neutrons. d. electrons.
2. The intermolecular force among the molecules of mercury is ....
   a. very large. b. relativily weak. c. vanished. d. very small.
3. All of the following atoms can take part in the formation of chemical compounds in ordinary conditions except .... atom.
   a. $_{17}Cl$ b. $_{6}C$ c. $_{8}O$ d. $_{10}Ne$
4. One gram of .... contains one type of atoms.
   a. iron b. ammonia c. hydrogen chloride d. water

B Mention an example of :

1. A good conductor of heat and electricity. *(Mokatam Sch. / Cairo 2022, Futures Sch. / Cairo 2020)* (........................)
2. A substance which is soft at room temperature. *(Akhnaton Egyption Sch. / Cairo 2020)* (........................)
3. A solution that is a bad conductor of electricity. *(Al-Resala Sch. / Qalyoubia 2020)* (........................)
4. A nobel gas. *(El-Menofia 2020)* (........................)

C What is the mathematical relationship that binds the following ?

Density, volume and mass.

....

Question 3 — 14 marks

A Correct the underlined words :

1. **Copper-gold** alloy is used in making heating coils. *(Akhnaton Egyption Sch. / Cairo 2020)* (........................)
2. The nucleus of the atom is **negatively** charged. *(Manaret Heliopolis Sch. / Cairo 2020)* (........................)

3. **Bromine** is the only liquid metal that its molecule consists of one atom.
(Manaret Heliopolis Sch. / Cairo 2020) (..........................)

4. The molecule of a compound consists of **similar** atoms.
(Orman College Sch. / Giza 2020) (..........................)

B Put (✓) or (✗) :

1. The molecules of solid substances vibrate in a simple vibratory motion.
(Al Mostaqbal Sch. / Aswan 2022) (   )
2. The outermost energy level of helium atom contains 8 electrons. (   )
3. The element symbol is derived from its English name. (   )
4. Helium and hydrogen are heavier than air. (   )

C Give a reason for :

In hydrogen atom, the atomic number equals the mass number.

....

Question 4 14 marks

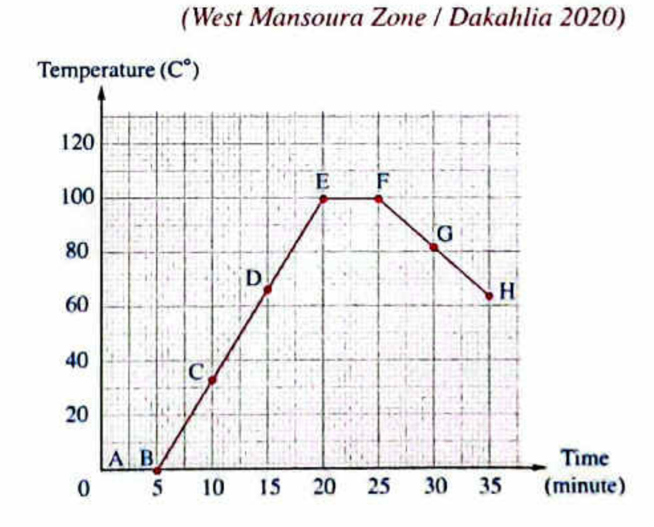
A Complete the following :

1. The symbol of sodium atom is ...., while the symbol of sulphur atom is ....
(Al-Mostaqbal Sch. / Aswan 2020)
2. .... solutions are bad conductors of electricity, while .... solutions are good conductors of electricity. *(Qus official Sch. / Qena 2020)*
3. .... take the shape of the container, while .... have definite shapes.
(Beni-Suef 2020)
4. The number of energy levels in the largest known atom is .... and the third energy level filled with .... electrons. *(West Mansoura Zone / Dakahlia 2020)*

B Water boils at 100 °C and freezes at 0 °C :

Ramy heated a beaker of ice cubes and recorded the change in its temperature over time, complete the following :

1. The time is taken for the melting of ice cube is ....
2. Which point in the graph did the water start to boil ? ....



C An object of density 0.5 gm/cm^3 and volume 10 cm^3. **Calculate its mass.**
(Manaret Heliopolis Sch. / Cairo 2020)

....

UNIT 2

Lesson One

Energy; Resources and Forms

Worksheet 11

1. Complete the following :

1. Work = ... x ....
2. Mechanical, ... , ... and electric energies are from forms of energy.
3. .... , ... and .... are from resources of energy.
4. We obtain .... energy from loudspeakers and .... energy from solar cells.
5. The energy stored in stretched spring is ...., while that is produced from burning of wood is ....

2. A. Write the scientific term :

1. It is the ability to do work. *(St. Joseph Sch. / Cairo 2020)* (..........................)
2. A form of energy stored in the food. *(East Zone / Alex. 2020)* (..........................)

B. The graph shows the relation between the potential energy of an object and its height from the ground.

1. What is the potential energy at a height of 5 metres ?

....

2. What is the decrease of the potential energy when the object falls from a height of 7 m. to 3 m. ?

....

3. Calculate the body weight.

....

3. A. Choose the correct answer :

1. Chemical energy is stored in the .... *(Akhnaton Egyptian Sch. / Cairo 20..)*
   a. car battery. b. car lamps.
   c. stretched spring. d. raising a load upwards.
2. The measuring unit of work is .... *(El-Agamy Direct. / Alex. 202.)*
   a. metre. b. newton. c. joule. d. kilogram.
3. .... is a permanent resource of energy.
   a. Petrol b. The Sun c. Coal d. Nuclear reaction

(Egypt Dream Sch. / Giza 2022, Orman College Sch. / Giza 20..)

4. When the height of an object is doubled, its ....
   a. kinetic energy will be doubled.
   b. mechanical energy will be four times its value.
   c. potential energy will be doubled.
   d. potential energy will be three times its value.

B. Give reasons for :

1. Some countries try to use the Sun, wind and the movement of water in generating electricity.

....

2. No changes in the potential energy when the object moves horizontally.

(El-Salam Sch. / Luxor 2020)

....

4. A. Problems :

1. What is the weight of a body, whose potential energy is 88 joule and it is found at a height of 11 m. from the Earth's surface ? *(Al-Mostaqbal Sch. / Aswan 2022, Sohag 2020)*

....

....

2. If the work done to move a box a distance 5 metres equals 20 joule.
   Calculate the force. *(Dream Sch. / Giza 2020)*

....

B. From the opposite figures :

Which figure represents doing work ? Why ?

....

....

....

Fig. (1) Fig. (2)

Worksheet 12

1. A. What is meant by ... ?

1. The kinetic energy of an object = 50 joule. *(St. Joseph Sch. / Cairo 2022)*

....

2. The potential energy of an object = 30 joule.

....

3. The mechanical energy of an object = 100 joule. *(Port Said 2020)*

....

B. Problems :

1. Calculate the mechanical energy of a body whose kinetic energy equals 1000 joule and potential energy equals 500 joule.

....

....

2. A ball was thrown up and when it reached 7 m., its speed was 8 m/sec. Calculate the potential energy, kinetic energy and the work done on it. If you know that the weight of the ball is 5 N and its mass is 0.5 kg. *(Science Inspectorate / Dakahlia 2022)*

....

....

....

....

....

2. A. Choose the correct answer :

1. When an object is thrown upwards, its .... *(Lycee Bab El-Louk Sch. / Cairo 2020)*
   a. speed increases gradually.
   b. speed decreases gradually.
   c. kinetic energy increases gradually.
   d. potential energy decreases gradually.
2. An object of mass 2 kg. moves at a speed of 4 m/sec., its kinetic energy is .... joule. *(St.Mark Sch. 2022, Lycee Bab El-Louk Sch. / Cairo 2020)*
   a. 16 b. 64 c. 32 d. 128

B. Put (✓) or (✗) :

1. The kinetic energy of a moving body is directly proportional to its mass. ( )
2. Potential energy = $\frac{1}{2}$ × Mass × $(\text{Speed})^2$ ( )

3. What is the mathematical relation between ... ?

1. Displacement, work and force. *(Qus Official Sch. / Qena 2020)*

....

2. Weight, potential energy and height.

....

3. Kinetic energy, mass and speed.

....

4. Kinetic energy, mechanical energy and potential energy. *(Qus Official Sch. / Qena 2020)*

....

4. A. The opposite figure represents a falling of a ball from position (A) to position (C) through (B). Answer the following :

(A)
2 m.
(B)
2 m.
(C)

1. The potential energy is maximum at .... and it equals zero at ....
2. The kinetic energy is equal to potential energy at ....
3. The kinetic energy = ... at (A).
4. If the weight of the ball is 5 newton, find its mechanical energy.

....

....

B. Give a reason for :

The kinetic energy will increase 4 times as the speed of the moving object is doubled.

....

UNIT 2

Lesson Two

Energy Transformations

Worksheet 13

1. A. Complete the following statements :

1. In the simple electric cell, the .... energy changes into .... energy. *(Dream Sch. / Giza 2020)*
2. When you move the pendulum to the left, then release it, the .... energy changes into .... energy.
3. The positive pole in the simple electric cell is ...., while the negative pole is .... *(Egypt Dream Sch. / Giza 2022, Thebes Sch. / Giza 2020)*
4. When the speed of the pendulum is maximum, the .... energy is maximum, while .... energy is minimum.

B. From the opposite figure, answer the following questions :

1. What is the name of the opposite device ? *(Modern Narmer Sch. / Giza 2022, Alex. 2020)*

....

2. Label the fig. :

(1) .... (2) ....

(3) .... (4) ....

(5) ....

(5)
-
+
(2)
(1)
(4)
(3)

3. Mention the scientific idea of this device.

....

2. A. What happens ... ?

1. When two plates made of copper and zinc are dipped in dilute sulphuric acid and are connected by a wire and a small lamp. *(Al-Ola Sch. / Cairo 2022)*

....

2. To the speed of the pendulum when you push it gently as shown in the figure. *(El-Gharbia 2020)*

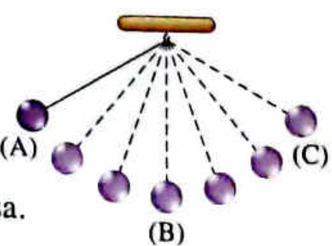
....

....

B. Choose the correct answer :

1. The mechanical energy of the pendulum at the highest point equals ....
   a. its kinetic energy only.
   b. kinetic energy × potential energy.
   c. its potential energy only.
   d. kinetic energy ÷ potential energy.

2. During moving a ball hanged in a thread as shown in the figure from left (A) to right (C), the ....
   a. kinetic energy changes into potential energy only.
   b. potential energy changes into kinetic energy only.
   c. potential energy changes into kinetic energy and vice versa.
   d. kinetic energy changes into heat energy.

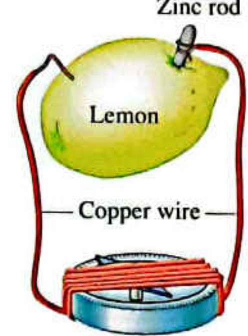


3. Problems :

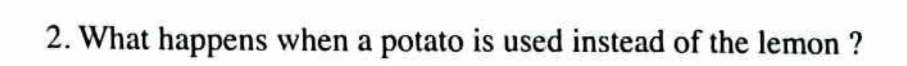
1. Someone kicked a ball of mass 0.5 kg. and weight 5 N. vertically upwards. At a height of 4 metres, its speed was 10 m/s. Calculate :
   a. The potential energy at 4 metres.
   ....
   b. The work done on the ball at the starting point.
   ....
   ....
   c. The maximum height that the ball reached.
   ....

2. A ball is thrown vertically to reach 20 m. height. If the weight of the ball is 5 newton, calculate its kinetic energy at :
   a. The highest point : ....
   b. The midpoint : ....

4. A. From the opposite figure :



1. What happens to the compass ? Explain that.
   ....
   ....



2. What happens when a potato is used instead of the lemon ?
   ....

B. Give a reason for :

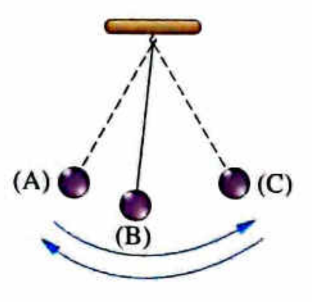
The motion of the children's swing is like that of the pendulum.

(El-Manahel Sch. / Sohag 2022)

....

C. From the opposite figure, complete the following table :

[Knowing that the mechanical energy at point (A) = 150 joule and K.E. at point (B) = 100 joule].



Position	Kinetic energy	Potential energy
(A)	....	....
(B)	....	....
(C)	....	....

Worksheet 14

1. A. Give reasons for :

1. Some technological applications have negative effects. *(Beni Suef 20*

....

....

2. Ecologists do not appreciate all the technological applications which are used in energy transformations.

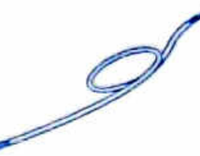
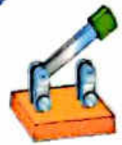
....

....

B. Use the following tools to construct an alarm electric circuit (with drawing) for :

1. A deaf person. 2. A blind person.



....

....

....

....

....

2. Complete the following table :

The device	Energy used	Energy produced
1.	Electric	....
2.	....	Sound
3.	Electric	....
4.	....	Electric
5.	Electric	....

3. Mention the harms which caused by each of the following :

1. Car exhaust : ....

(East Zone / Alex. 2020)

2. Nuclear weapons : ....

3. Chemical pesticides : ....

....

(East Zone / Alex. 2020)

4. A. Choose the correct answer :

1. In the cellular phone, the ....
   a. electric energy changes into mechanical energy.
   b. light energy changes into heat energy.
   c. electric energy changes into sound and light energies.
   d. chemical energy changes into light energy.

2. Chemical energy ⟶ Heat energy ⟶ Mechanical energy.
   The sequence of energy changes shown in the diagram explains ....
   a. a flashlight is on. b. a candle burns.
   c. fuel burns to power a car. d. the photosynthesis process.

3. The motor converts the electric energy into .... energy.
   a. magnetic b. chemical c. light d. kinetic

4. In the car engine, the chemical energy changes into .... energy at first.
   a. heat b. electric c. mechanical d. light

(Leaders Sch. / Cairo 2022, Sohag 2020)

5. The role of the technological applications is represented in ....
   a. using energy resources and converting energy from one form to another.
   b. creating energy from nothing.
   c. storing energy as its form is.
   d. illustrating energy forms.

B. Write the scientific term :

1. Energy is neither created nor destroyed, but it is converted from one form to another.
   (Taymour Sch. / Alex. 2022, Ramses College Sch. / Cairo 2020) (..........................)

2. The pollution produced from the networks of wireless transmitters of cellular phones.
   (El-Menofia 2020) (..........................)

Worksheet 15 on Lessons One & Two Unit 2

1. Complete the following :

1. The measuring unit of energy is ...., while that of weight is ....
2. The kinetic energy of a moving body depends on its .... and ....

(El-Salam Sch. / Luxor 2020)

3. In electric bell .... energy is changed into .... energy.
4. When an object falls downwards, its .... energy converts into .... energy.

2. A. Choose the correct answer :

1. When you lift an object, you do work that is stored in the object in the form of ....
   - a. potential energy.
   - b. kinetic energy.
   - c. mechanical energy.
   - d. heat energy.
2. Kinetic energy of the object increases by ....
   - a. increasing the mass.
   - b. decreasing the weight.
   - c. increasing the height from the ground.
   - d. decreasing the mass.
3. The simple electric cell contains ....
   - a. dil.HCl
   - b. HNO_3
   - c. dil.H_2SO_4
   - d. NaCl

B. Give reasons for :

1. The work done to stop a moving car increases by increasing the mass of the car.

....

....

2. When we use a potato instead of the lemon in the simple electric cell, the needle of the compass deflects.

....

....

3. **A. Put (✓) or (x) :**

1. Force = $\frac{\text{Work}}{\text{Displacement}}$ ( )
2. The developed countries aim to use the energy produced from fuel. ( )
3. We use an electric lamp as a tool for a deaf person. ( )
4. Energy is created but not destroyed. *(Menouf Directorate / Menofia 2022)* ( )
5. The potential energy of two identical objects at 5 m. height have different values. ( )

B. What happens when ... ?

1. Combustion of food in the human body.

....

....

2. An object moves horizontally (concerning its potential energy).

....

3. Overuse of chemical pesticides. *(St. Joseph Sch. / Cairo 2020)*

....

....

4. **A. What is meant by the law of conservation of energy ?**

(El-Kharga Directorate / New Valley 2022, El-Agami Zone / Alex. 2020)

....

....

B. Mention :

The factors affecting the potential energy.

....

....



Heat Energy

Worksheet 16

1. A. Complete the following :

1. Heat is transferred in three methods which are ...., ... and ....
2. The temperature .... when the kinetic energy of the particles increases and it is measured by the ....

B. Write the scientific term :

1. A form of energy which is transferred from the object of higher temperature to that of lower temperature.
(El-Manahel Sch. / Sohag 2022, St. Joseph Sch. / Cairo 2020) (........................
2. The way by which the heat is transferred through solids.
(Mokatam Sch. / Cairo 2022, Sohag 2020) (........................

2. Choose the correct answer :

1. If you mix 10 ml. water of 20°C with 10 ml. tea of 80°C, the expected temperature of the mixture is ....
   a. 20°C b. 80°C c. 50°C d. 90°C
2. On rubbing your hands, the ....
   a. heat energy is converted into sound energy.
   b. kinetic energy is converted into heat energy.
   c. heat energy is converted into kinetic energy.
   d. sound energy is converted into heat energy.
3. The heat is transferred through copper or metallic wires by ....
   a. conduction and convection. b. radiation only.
   c. conduction and radiation. d. conduction only.

3. A. Give a reason for :

Cooking pans are made up of copper and aluminium. *(Alex. 202*

....

B. Study the opposite figure, then answer :

Heat transfers through different media by : (conduction, convection and radiation). Mention the method of transferring heat in each area (A , B , and C).

(A) Air — (B) Iron — Fire — Air (C)

4. A. What is meant by temperature ?

....

....

B. From the opposite figure, answer the following questions : *(Al-Farouk Sch. / Cairo 2022)*

1. Heat will transfer from .... to ....
2. The transfer of heat will stop when ....

Object (A)	Object (B)
60°C	40°C

Worksheet 17

1. Give reasons for :

1. Heater is put at the bottom of the room.

(Taymour Sch. / Alex. 2022, Akhnaton Egyptian Sch. / Cairo 2020)

....

....

2. The production of electricity from solar energy is preferred to that produced from burning of fuel.

....

....

3. The heat of the Sun is transferred to us by radiation.

(Mokatam Sch. / Cairo 2022, Futures Sch. / Cairo 2020)

....

....

4. Using solar heater is preferred than gas heater. *(Thebes Sch. / Giza 2020)*

....

....

2. A. Choose the correct answer :

1. Heat is transferred by radiation through .... *(Sohag 2020)*
   a. liquids only. b. gases only.
   c. metals only. d. material media and non-material ones.
2. .... is a non-renewable resource of energy.
   a. Sun b. Electricity c. Petroleum d. Soil

3. The heat of the heater is transferred by .... (Lycee Bab El-Louk Sch. / Cairo 2

a. conduction and radiation.
b. radiation and convection.
c. conduction and convection.
d. radiation only.

4. The Sun is .... (Lycee Bab El-Louk Sch. / Cairo 2

a. a resource of permanent energy.
b. a resource of non-permanent energy.
c. not an energy resource.
d. producing no energy.

B. Mention the method of heat transfer in each figure :

Fig. (1)
....

Liquid

Fig. (2)
....

3. A. Write the scientific term :

1. The way by which the heat is transferred through gases and liquids. (..................
(Al-Resala Sch. / Qalyoubia 2

2. The way by which the heat is transferred through gases and space and it doesn't need a medium to transfer through.
(Manaret Heliopolis Sch. / Cairo 2020) (..................

B. Complete the following statements :

1. .... is a renewable resource of energy, while .... is a non-renewable resource of energy.

2. .... , ... and .... are from technological applications that produ heat energy.

3. Heat is transferred through gases by .... and .... (Modern Narmer Sch. / Giza 2

4. A. Give three examples illustrating that the solar energy is the origin of other form energy.

....
....
....

B. Mention the changes of energy in the following :

1. Solar oven : ....
2. Solar battery : ....

General Exercise of the School Book  on Unit Two

1. Choose the correct answer to complete the following statements :

1. In the filament of electric lamp, the ....
   a. electric energy is converted into mechanical energy.
   b. light energy is converted into heat energy.
   c. electric energy is converted into heat energy.
   d. chemical energy is converted into light energy.

2. When car lamps and radio cassette are on, there is a change inside the car battery from ....
   a. chemical energy into a light one.
   b. chemical energy into a sound one.
   c. chemical energy into an electric one.
   d. electric energy into a light one.

3. In home when the gas stove is working, there is a change from ....
   a. heat energy into a chemical one.
   b. chemical energy into a heat one.
   c. chemical energy into a sound one.
   d. light energy into a heat one.

4. As an object falls downwards, ...
   a. the potential energy increases.
   b. the kinetic energy increases.
   c. the mechanical energy is lost.
   d. the speed of the object decreases.

5. As an object is launched upwards, ...
   a. its speed decreases.
   b. its speed increases.
   c. its kinetic energy increases gradually.
   d. its potential energy decreases gradually.

6. In the simple pendulum, there is an energy transformation from ....
   a. mechanical energy into a sound one.
   b. mechanical energy into a light one.
   c. potential energy into a kinetic one and vice versa.
   d. kinetic energy into a heat one.

7. Heat is transferred through solids by ....
   a. conduction and convection.
   b. radiation only.
   c. radiation and convection.
   d. conduction only.

8. Heat transfers from a heater by ....
   a. conduction and radiation.
   b. radiation and convection.
   c. conduction and convection.
   d. radiation only.

2. What is meant by the following ... ?

1. Potential energy of an object is 20 joule.

2. Kinetic energy of an object is 20 joule.

3. Mechanical energy of an object is 100 joule.

4. Heat energy.

3. Give reasons for :

1. The freezer is found at the top of fridge.

2. The heater is placed on the ground.

3. Fuel in a car is as food for a man.

4. Nuclear stations which produce electricity are preferred to those of petrol stations.

5. Ecologists do not appreciate all the technological applications which used in energy transformations.

4. Name five of the technological applications which convert an energy form to another, then mention what the energy transformation in each application is.

....

....

....

....

....

5. A stone of 5 kg. mass falls from 8 m. height, what is its potential energy and what is its kinetic energy in each of the following ? (considering that the gravity acceleration = 10 m/s^2.)

1. At the start of falling.

....

....

2. At a height of 2 m.

....

....

3. On reaching the ground.

....

....

6. Find the weight of an object of potential energy 88 joule when it is found at a height of 11 m.

....

....

7. An object has a kinetic energy 64 joule and is moving at a velocity of 4 m/s. Find the object mass.

....

....

Model Exams on Unit 2

Model Exam 1

56

Answer the following questions :

Question 1 *14 marks*

A Choose the correct answer :

1. .... is a form of energy which is transferred from an object with higher temperature to another object with lower temperature.
   a. Potential energy b. Kinetic energy c. Heat energy d. Mechanical energy
2. .... is a renewable source of energy. *(Mokatam Sch. 2022, Futures Sch. / Cairo 2020)*
   a. Coal b. Petrol c. Wind d. Natural gas
3. Food and fuel are sources of .... energy. *(Thebes Sch. / Giza 2020)*
   a. chemical b. electric c. potential d. sound
4. The electric current in the simple electric cell passes from the ....
   a. positive copper plate to negative zinc plate.
   b. positive zinc plate to negative copper plate.
   c. negative zinc plate to positive copper plate.
   d. negative copper plate to positive zinc plate.

B Write the scientific term of each of the following :

1. The sum of potential and kinetic energies. *(El-Agami Zone / Alex. 2020)* (..............................
2. The way by which the heat is transferred through gases and space.
   (Manaret Heliopolis Sch. / Cairo 2020) (..............................
3. Energy is neither created nor destroyed, but it is converted from one form to another. *(Manaret Heliopolis Sch. / Cairo 2020)* (..............................
4. The work done during the motion of an object.
   (Al-Farouk Sch. / Cairo 2022, Sohag 2020) (..............................

C Give a reason for :

A bike tire gets hot once you press the brakes. *(El-Agami Zone / Alex. 2020)*

....

....

Question 2 — 14 marks

A Complete the following :

1. The electric circuit contains .... to produce electric energy and .... to use this energy. *(Ramses College Sch. / Cairo 2020)*
2. In sewing machine, ... energy changes into .... energy.
3. .... is a resource of energy , while .... is a form of energy.
4. When air is heated, its density ...., so it moves .... to be replaced by cold air.

B Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Solar cell	a. changes the nuclear energy into electric energy.
2. Nuclear reactor	b. changes the electric energy into heat energy.
3. Electric heater	c. changes the solar energy into electric energy.
4. Electric lamp	d. changes the solar energy into heat energy.
	e. changes the electric energy into heat and light energies.

1. (..........) 2. (..........) 3. (..........) 4. (..........)

C What happens if ... ?

Doubling the weight of an object (concerning its potential energy).

(El-Agamy directorate / Alex. 2022, Dream Sch. / Giza 2020)

....

Question 3 — 14 marks

A Correct the underlined words :

1. In photosynthesis process, the <u>electric</u> energy changes into chemical energy. (..........................)
2. Loudspeakers cause <u>massive destruction</u>. (..........................)
3. Heat transfers through liquids by <u>radiation</u>. *(Akhnaton Egyptian Sch. / Cairo 2020)* (..........................)
4. The kinetic energy of an object has mass 5 kg. and speed 4 m/sec. is <u>64 newton</u>. *(El-Gharbia 2020)* (..........................)

B Choose the odd word out, then write the scientific term of others :

1. Sun – Wind – Food – Heat energy.
2. Weight – Height – Potential energy – Mass. *(Sharm El-Sheikh Zone / South Sinai 202*
3. Conduction – Convection – Friction – Radiation. *(Leaders Sch. / Cairo 202*
4. Solar heater – Electric stove – Coal heater – Solar cell. *(El-Gharbia 202*

The odd word	The scientific term
1.	....
2.	....
3.	....
4.	....

C Compare between : Transfer of heat by conduction and convection (definition only).

Transfer of heat by conduction	Transfer of heat by convection
....	....
....	....
....	....

Question 4 *14 marks*

A Put (✓) or (✗), then correct what is wrong :

1. Cold air rises up, but hot air falls down. *(Thebes Sch. / Giza 2020)*
   ( ) ....
2. The heat of the Sun transfers by radiation only. *(West Mansoura Zone / Dakahlia 2020)*
   ( ) ....
3. When an object is launched up, the mechanical energy increases.
   ( ) ....
   (West Mansoura Zone / Dakahlia 2020)
4. No change occurs in the potential energy when the object moves horizontally.
   ( ) ....
   (El-Menofia 2020)

B Look at the opposite figure, then answer : *(Egypt Dream Sch. / Giza 2020)*

1. Mention the name of the opposite figure.

....

2. Label the figure.

(1) .... (2) .... (3) ....

3. This device changes .... energy into .... energy.

C In the opposite figure :

Arrange the four balls ascendingly according to the depth occurred by the balls when they dropped in sand, and give a reason for your answer.
(Knowing that the balls are made of the same matter and have the same weight).

....

....

....

Model Exam 2

56

Answer the following questions :

Question 1 — 14 marks

A Put (✓) or (✗), then correct what is wrong :

1. Height of the object = Object's mass × Earth's gravity acceleration.
   ( ) ....
2. In the car dynamo, a part of mechanical energy changes into potential energy.
   ( ) ....
3. When the air is heated, its density increases, so it falls down.
   ( ) ....
   (Al-Resala Sch. / Qalyoubia 2020)
4. Petroleum is a permanent source of energy. *(Alex. Sch. / Alex. 2020)*
   ( ) ....

B **Choose from column (B) what suits it in column (A) :** *(Manaret Heliopolis Sch. / Cairo 2020)*

(A)	(B)
1. Electric lamp	a. is a source of nuclear energy.
2. Wind generator	b. is a source of heat energy.
3. Radio cassette	c. is a source of electric energy.
4. Oven	d. is a source of light energy.
	e. is a source of sound energy.

1. (..........) 2. (..........) 3. (..........) 4. (..........)

C **Give a reason for :**

The freezer is found at the top of the fridge.

(Manaret El-Eman Sch. / Cairo 2022, East Zone / Alex. 2020)

....

....

Question 2 — 14 marks

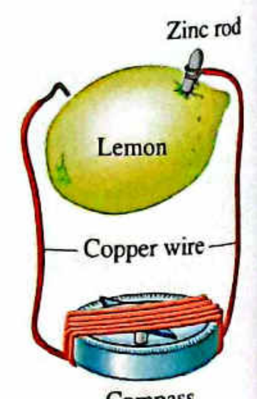
A **Complete the following :**

1. Heat is carried from the fire heater to our bodies by .... and ....
2. In the dynamo, ... energy changes into .... energy.
   (Suez Directorate / Suez 2022, Futures Sch. / Cairo 2020)
3. Heat transfers through solids by ...., while through liquids by ....
   (Dream Sch. / Giza 2020)
4. Mechanical energy = ... + ... *(Mokatam Sch. / Cairo 2022)*

B **Write the scientific term of each of the following :**

1. The pollution resulted from the networks of wireless transmitters of cellular phones. *(Sharm El-Sheikh Zone / South Sinai 2020)* (..........................)
2. The ability to do work or to make a change.
   (Manaret El-Eman Sch. / Cairo 2022, Egypt Dream Sch. / Giza 2020) (..........................)
3. The product of multiplying the force by the displacement.
   (Al-Ola Sch. / Cairo 2022) (..........................)
4. The heat condition which determines the direction of heat energy whether from or to the object when it comes in contact with another. (..........................)

C **In the opposite figure :**
What happens ... ?



1. To the needle of the compass when we dip the copper wire into the lemon.

   ....

2. If we replace the zinc rod by a copper rod.

   ....

Question 3 *14 marks*

A Choose the correct answer :

1. Electric energy changes into heat energy in the ....
   a. car dynamo. b. car engine.
   c. car air conditioner. d. car radio cassette.

2. In television, ... energy changes into light and sound energies.
   a. nuclear b. electric c. radiant d. solar

3. The measuring unit of work is ....
   a. metre. b. second. c. newton. d. joule.

4. Mechanical energy is converted into heat energy by means of .... *(Port Said 2020)*
   a. electric generator.
   b. electric heater.
   c. electric motor.
   d. friction among moving particles with each other.

B Choose the odd word out, then write the scientific term of others :

1. Sun – Coal – Petrol – Natural gas.
2. Solar furnace – Solar oven – Solar heater – Solar battery.
3. Speed – Weight – Mass – Kinetic energy.
4. Nuclear reactors – Food – Weight – Sun.

The odd word	The scientific term
1.	....
2.	....
3.	....
4.	....

C What is meant by the law of conservation of energy ? *(Port Said 2020)*

....

....

Question 4 14 marks

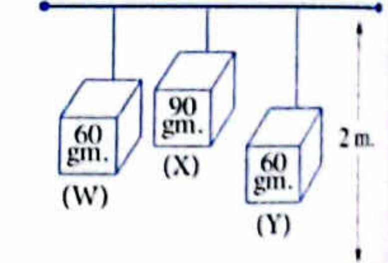
A Correct the underlined words :

1. Heat transfers through oil by **conduction**. (..........................)
2. An object, whose mass is 2 kg moves at a speed of 5 m/sec., so its kinetic energy is **15 joule**. (..........................)
3. Potential energy is affected by the **velocity** and the height of the object. *(East Zone / Alex. 2020)* (..........................)
4. In the simple electric cell, **copper** rod is considered the negative pole. *(Sohag 2020)* (..........................)

B Complete the following table :

Technological application	The effect on the environment (Polluting / Non-polluting)
1. Solar oven	....
2. Gas stove	....

C Study the opposite figure, then answer the following questions :



1. Which weight has the highest potential energy ? Why ?

....

....

2. Which weight has the lowest kinetic energy at the time it reaches the ground when cutting the strings ? Why ?

....

....



Living Organisms Diversity and Principles of their Classification

Worksheet 18

1. Complete the following sentences :

1. .... , ... and .... are micro-organisms that live in water.

(Lycee Bab El-Louk Sch. / Cairo 2020)

2. Plants may carry large-sized leaves as ...., or small-sized leaves as ....

(Al-Mostaqbal Sch. / Aswan 2022)

3. .... dye is used in preparation of sample of stagnant water.

2. What do you expect in the following case ... ?

When you examine a drop of pond water under a microscope.

....

....

3. Choose the correct answer :

1. All of the following are animals that live in water except ....

a. fishes. b. lizards. c. hippopotami. d. crocodiles.

2. All of the following are unicellular organisms except ....

a. amoeba. b. paramecium. c. rhinoceros. d. euglena.

3. .... are considered from small herbs.

a. Camphor and palm b. Clover and gargeer

c. Banana and clover d. Camphor and banana

4. A. Give reasons for :

1. Living organisms must be classified. *(St. Joseph Sch. / Cairo 2020)*

....

....

2. We can distinguish between banana plant and molukhiyah plant.

....

....

B. What is meant by micro-organisms ?

....

....

Worksheet 19

1. Mention one difference between each of the following :

(St.Mark Sch. / Minia 2022, St. Joseph Sch. / Cairo 202...)

1. Insects and arachnids :

....

....

(Alex. Sch. / Alex. 20...)

2. Bean plant and maize plant :

....

....

2. Choose the correct answer :

1. The animal which has no body support is .... *(East Zone / Alex. 20...)*
   a. snail. b. hedgehog. c. mussel. d. earthworm.
2. Cycas plant belongs to .... *(El-Agamy / Alex. 2022, Port Said 20...)*
   a. angiosperms. b. brown algae. c. gymnosperms. d. ferns.
3. .... are considered from monocotyledon plants.
   a. Bean and pea b. Camphor and clover
   c. Clover and gargeer d. Maize and wheat
4. The number of pairs of legs in scorpion is ....
   a. 3 b. 4 c. 44 d. 100
5. Pea plant belongs to .... plants.
   a. ferns b. dicotyledon c. terrestrial d. monocotyledon

(Al-Ola Sch. / Cairo 2022, West Mansoura Zone / Dakahlia 20...)

6. All of the following are arthropods having three pairs of jointed legs except ....
   a. scolopendra. b. bees. c. locust. d. cockroaches.

3. A. Complete the following statements :

1. Flowering plants are classified into .... and .... plants.
2. .... is an example for plants that reproduce by formation of spores, but .... is an example for plants that reproduce by formation of seeds inside cones.

B. Write the scientific term :

(El-Kharga / New Valley 202...)

1. A group of plants which can't be distinguished into roots, stems and leaves. (..........................)

(El-Tur / South Sinai 2022, St. Joseph Sch. / Cairo 20...)

2. They are small terrestrial plants reproduce by formation of spores. (..........................)
3. Animals that their bodies have an internal support. (..........................)

4. Mention the number of jointed legs in each of the following arthropods :

1. Julius : ....

2. Spider : ....

3. Fly : ....

5. **A. Give an example for each of the following :**

1. A dicotyledon plant : ....

(Thebes Sch. / Giza 2020)

2. An animal with an external support : ....

(Thebes Sch. / Giza 2020)

3. A plant that can't be distinguished into roots, stems and leaves : ....

(El-Montazah / Alex. 2022, El-Salam Sch. / Luxor 2020)

4. An animal which doesn't have a body support : ....

(El-Manar Sch. / Ismailia 2020)

5. A plant from ferns : ....

(El-Agamy / Alex. 2022, El-Salam Sch. / Luxor 2020)

6. A non-flowering plant : ....

(Alex. Sch. / Alex. 2020)

B. Give a reason for :

Spider is not from insects. *(Egypt Dream Sch. / Giza 2022, Orman College Sch. / Giza 2020)*

....

....

Worksheet 20

1. **A. Give a reason for :**

The front teeth of hedgehog are extending outwards.

(Mokatam Sch. / Cairo 2022, Futures Sch. / Cairo 2020)

....

B. Choose the odd word out, then write the scientific term of others :

1. Ant – Bee – Spider – Fly. *(El-Resala Sch. / Qalyoubia 2020)*
2. Amoeba – Euglena – Paramecium – Snake.
3. Octopus – Desert snail – Frog – Mussel. *(Beni Suef 2020)*

The odd word	The scientific term
1.	....
2.	....
3.	....

2. Complete the following statements :

1. .... and .... belong to teethless mammals. *(St.Mark Sch. / Minia 2022, Beni Suef 2020)*
2. .... is the basic unit of classification of living organisms.
3. Animals that have sharp incisors are classified according to the number of incisors in each jaw into .... and ....

3. Define each of the following :

1. Species : .... *(Al-Farouk Islamic Sch. / Cairo 2022)*
....
....
2. Taxonomy : .... *(North Giza / Giza 2022)*
....
....

4. Mention the shape and the kind of teeth in each of the following organisms :

1. Rabbit : ....
2. Squirrel : ....
3. Hedgehog : ....
4. Tiger : ....

5. Write the names of the following living organisms, then classify them according to what you have studied :

1.	2.	3.	4. ....
5.	6.	7.	8. ....
9.	10.		



Adaptation and Diversity of Living Organisms

Worksheet 21

1. A. Write the scientific term :

1. The ability of some body organs and tissues to do certain functions.
(East Tanta / Gharbia 2022, El-Agami Zone / Alex. 2020) (..........................)
2. The type of adaptation in the activity of some birds in different times of the daylight. *(El-Resala Sch. / Qalyoubia 2020)* (..........................)

B. Mention the causes of adaptation in animals :

....

....

2. A. Complete the following statements :

1. Types of adaptation are structural, ... and ....
2. Horse limbs end in .... to run over rocky soil, whereas camel limbs end in .... to walk on hot sandy soil. *(El-Manahel Private Sch. / Sohag 2022, Port Said 2020)*
3. The whale front limbs are modified into .... to take the role of ...., whereas they are modified in the bat into .... to take the role of ....
(Qena 2022, El-Salam Sch. / Luxor 2020)
4. Hawks have .... beaks to tear the prey's flesh, while ducks have .... beaks to help them filter their food from water.
5. Ducks and geese feed on .... and ....
6. .... and .... are examples of predatory birds which feed on ....

B. Choose the correct answer :

1. Secretion of sweat on rising human body temperature is .... adaptation.
   a. functional b. anatomical c. behavioural d. structural
   (El-Montazah / Alex. 2022, Akhnaton Egyptian Sch. / Cairo 2020)
2. Which of the following is an example of behavioural adaptation ? ....
   a. Camel pad.
   b. Secretion of poison.
   c. Birds migration.
   d. Secretion of sweat. *(Futures Sch. / Cairo 2020)*
3. .... is (are) from the environmental changes that lead to adaptation.
   a. Climate change
   b. Food diversity
   c. Existence of water
   d. All the previous answers

4. Mammals move by all of the following ways except ....

a. swimming. b. flying. c. absorption. d. running.

5. Number of anterior fingers of hawk is .... (Al-Mostaqbal Sch. / Aswan 202

a. 3 b. 4 c. 2 d. 1

6. The organs of birds that are adapted for feeding are the ....

a. beaks and wings. b. legs and beaks.

c. beaks and eyes. d. wings and eyes.

7. .... are from the birds that feed on shallow water worms and snails.

a. Ducks and geese b. Heron and hoopoe

c. Hawk and vultures d. All of the previous birds

3. **A. What is meant by ... ?**

1. Adaptation : ....

....

2. Anatomical adaptation : ....

....

B. Give reasons for :

1. The bones of the front limbs and fingers of monkey are elongated.

....

2. The two front limbs in the whale and dolphin are different from the two front limbs of bat although they are structured with similar bones.

....

....

3. Some birds have long thin beaks and long thin legs ending in thin toes.

....

....

(Alex. Sch. / Alex. 202

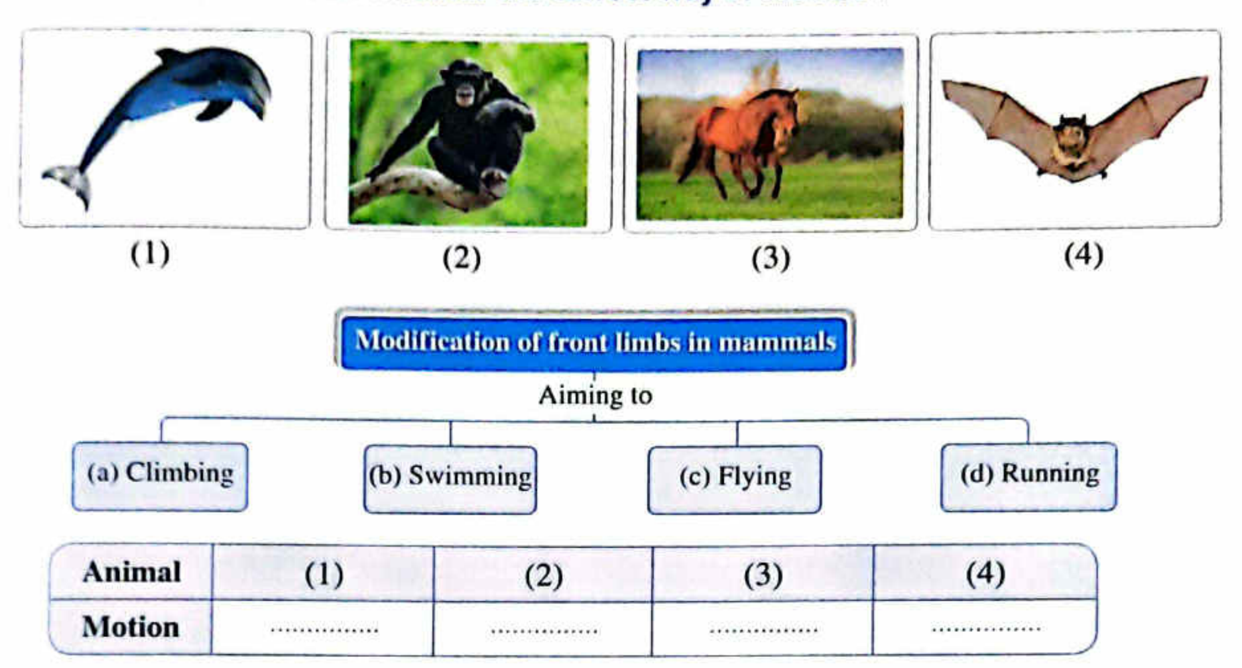
4. **A. What is the function of each of the following ... ?**

1. The palm legs in the geese : ....

(Leaders Sch. / Cairo 2022, Orman College Sch. / Giza 202

2. The four fingers in vultures : ....

B. Use the figures (1 to 4) and the information in the chart below to write the number of the animal that best matches the correct way of motion :



Animal	(1)	(2)	(3)	(4)
Motion	....	....	....	....

C. What are the results based on ... ?

1. The variety of ways of movement in mammals.

....

2. The variety of food for birds.

....

Worksheet 22

1. Give reasons for :

1. Some plants pounce and digest insects. *(Egypt Dream Sch. / Giza 2020)*

....

2. Some animals hibernate in winter.

....

3. Some birds migrate in winter. *(Beni-Suef 2020)*

....

4. Chameleon colours itself with the dominant colours in the environment.

....

2. A. Choose the correct answer :

1. All of the following are characteristics of predacious plants except ....
   a. they are autotrophic green plants. b. they absorb the nitrogenous substances.
   c. they can make photosynthesis process. d. they can make carbohydrates.
2. .... is from the rodents that undergo aestivation. *(Futures Sch. / Cairo 202..)*
   a. Desert snail b. Jerboa c. Squirrel d. Rat
3. .... is/are considered from the animals that tend to hibernate.
   a. Frog b. Jerboa c. Snail d. Ant
   (St. Joseph Sch. / Cairo 2020)
4. .... bird migrates in winter. *(Al-Farouk Islamic Sch. / Cairo 2022)*
   a. Quail b. Ostrich c. Duck d. Sparrow

B. What is the difference between hibernation and aestivation ... ?

(Lycee Bab El-Louk Sch. / Cairo 2020)

Hibernation	Aestivation
....	....
....	....
....	....
....	....

3. Complete the following statements :

1. .... , ... and .... are examples of insectivorous plants.
   (Al-Mostaqbal Sch. / Aswan 2022, Lycee Bab El-Louk Sch. / Cairo 2020)
2. In winter, frogs bury themselves in mud and that is called ...., while in summer, jerboa hides in humid burrows and that is called ....
3. Birds migration is a .... adaptation.
4. .... , ... and .... are considered from the forms of adaptation in living organisms with the environmental changes.
5. Desert animals avoid the effects of high temperature by hiding in humid ....
6. .... , ... and .... are examples of camouflage.

4. A. What is meant by camouflage ? (Give an example). *(Modern Narmar Sch. / Giza 2022)*

....

....

B. What happens if stick insect or leaf insect settle on a white wall ?

....

....

General Exercise of the School Book  on Unit Three

1. Complete the following sentences :

1. .... and .... are examples of micro-organisms that live in water.
2. The number of jerboa's upper jaw incisors is .... and their number in the rabbit's upper jaw is ....
3. Armadillo belongs to .... mammals and the hedgehog belongs to .... mammals.
4. .... is from the plants that reproduce by the formation of spores, whereas .... is from the plants that produce seeds inside cones.

2. Choose the correct answer :

1. The number of the anterior fingers in a hawk is .... finger(s).
   a. 3 b. 4 c. 2 d. 1
2. .... belongs to the animals with no body support.
   a. Octopus b. Mussel c. Hedgehog d. Snake
3. The examples of living organisms that undergoes hibernation is the ....
   a. desert snail. b. jerboa. c. frog. d. (a) , (b) and (c)
4. Pea plant belongs to .... plants.
   a. ferns b. monocotyledon c. dicotyledon d. gymnosperm
5. .... is from the rodents that undergo aestivation.
   a. Rat b. Squirrel c. Jerboa d. Desert snail

3. Give one difference between each of the following :

1. Insects and arachnids.

....

....

2. Rodents and lagomorphs.

....

....

3. Bean plant and maize plant.

....

....

4. Give reasons for :

1. The individuals of the same species differ in some external characteristics.

....

....

2. Some animals undergo hibrenation.

....

....

5. What do you expect in each of the following cases ... ?

1. Polar bear can't undergo hibernation.

....

....

2. The aestivated animals don't store their food in the form of fats.

....

....

3. The beaks of a hoopoe and a hawk are mutually exchanged.

....

....

4. Predatory plants can't capture insects for a long period of time.

....

....

6. Give an example to show the adaptation of the following living organisms with the environmental conditions :

1. Duck : ....

2. Heron : ....

3. Hedgehog : ....

4. Dieonea plant : ....

7. What are the results based on the following ... ?

1. The variety of the ways of motion in mammals.

....

2. Increasing the well known species of living organisms.

....

Model Exam 1

56

Answer the following questions :

Question 1 14 marks

A Complete the following :

1. .... is the behaviour that some animals do by hiding in humid burrows in winter.
2. .... is an example of functional adaptation.
3. .... , ... and .... are examples of angiosperms.
4. The front limbs of whale are modified into .... *(Orman College Sch. / Giza 2020)*
5. Paramecium moves by ...., while amoeba moves by ....
(Sharm El-Sheikh Zone / South Sinai 2020)

B Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Hedgehog	a. an arthropod animal that has four pairs of jointed legs.
2. Locust	b. a mammal animal that has pointed canines and molars with sharp projections.
3. Spider	c. a mammal animal that has front teeth extending outwards.
4. Tiger	d. a mammal animal that has no teeth.
	e. an arthropod animal that has three pairs of jointed legs.

1. (..........) 2. (..........) 3. (..........) 4. (..........)

C What happens if ... ?

Chameleon goes to sandy area.

....

Question 2 14 marks

A Choose the correct answer :

1. All of the following are forms of adaptation except ....

a. hibernation. b. aestivation. c. birds migration. d. extinction.

2. .... is from autotrophic insectivorous plants.

a. Drosera b. Elodea c. Palm d. Adiantum

3. The front limbs of .... are modified into wings.

a. horse b. monkey c. bat d. dolphin

4. The leg of the bird tells us that this bird can ....

a. run fast. b. swim.

c. fly fast. d. climb rocks.

B Put (✓) or (✗), then correct what is wrong :

1. The aquatic turtle has an internal support only. *(Al-Resala Sch. / Qalyoubia 20*
( ) ....
2. Ducks and geese have plam legs to help them in swimming. *(Qena 2022, Thebes Sch. / Giza 20*
( ) ....
3. Rat, rabbit and jerboa have one pair of incisors in each jaw. *(Al-Resala Sch. / Qalyoubia 20*
( ) ....
4. Frogs hibernate in summer by hiding in burrows. *(Thebes Sch. / Giza 20*
( ) ....

C Give a reason for :

Desert snail is an example of behavioural adaptation.

....

Question 3 *14 marks*

A Correct the underlined words :

1. Amoeba is an example of **multi-cellular** organisms.
(East Tanta / Gharbia 2022) (......................
2. **Species** is a branch of biology that searches for the similarities and differences amon living organisms. (......................
3. Long thin beaks in heron is an example of **functional adaptation**. (......................
4. **Bean** is an example of insectivorous plants.
(Akhnaton Egyptian Sch. / Cairo 2020) (......................

B Write the scientific term of each of the following :

1. The basic classification unit for living organisms.
(Behira 2022, Lycee Bab El-Louk Sch. / Cairo 2020) (......................

2. When desert animals decrease their activity during summer time. (..........................)
(Ramses College Sch. / Cairo 2020)

3. Living organisms that can't be seen by the naked eye, but they spread everywhere around us. *(St. Joseph Sch. / Cairo 2022, El Salam Sch. / Luxor 2020)* (..........................)

4. The ability of some living organisms to hide from their enemies.
(Mokatam Sch. / Cairo 2022, Futures Sch. / Cairo 2020) (..........................)

C Give one difference between : Angiosperms and gymnosperms.

Angiosperms	Gymnosperms
....	....
....	....
....	....

Question 4 14 marks

A Choose the odd word out, then write the scientific term of others :

1. Wheat – Pea – Maize – Bean – Vougheir. *(Beni Suef 2020)*
2. Dieonea – Drosera – Elodea – Halophila. *(El-Gharbia 2020)*
3. Lion – Tiger – Dog – Wolf – Armadillo. *(Qena 2022, Beni Suef 2020)*
4. Ducks – Hawk – Vulture – Crow.

The odd word	The scientific term
1.	....
2.	....
3.	....
4.	....

B What does these numbers indicate ... ?

1. Four pairs of jointed legs.

....

2. Three pairs of jointed legs.

....

C What is meant by functional adaptation ?

....

....

Model Exam 2

56

Answer the following questions :

Question 1 — 14 marks

A Choose the correct answer :

1. Some animals are characterized by the presence of an internal and an external support as ....

a. fish. b. snail. c. mussel. d. aquatic turtle.

2. .... is an example of insects.

a. Bee b. Scorpion c. Julius d. Spider

3. The bat is considered from .... that fly.

a. insects b. reptiles c. mammals d. amphibians

4. The shown leg belongs to a/an .... *(Ramses College Sch. / Cairo 2020)*

a. owl.
b. blue bird.
c. duck.
d. hawk.

B Correct the underlined words :

1. **Pea plant** reproduces by formation of spores. *(El-Menofia 2020)* (..........................)
2. **Quail** is an example of an animal that undergoes aestivation. *(Sohag 2020)* (..........................)
3. **Octopus** is from myriapods. *(Egypt Dream Sch. / Giza 2020)* (..........................)
4. The desert ship is **horse**. *(El-Salam Sch. / Luxor 2020)* (..........................)

C What happens if ... ?

Mating between a donkey and a horse.

....

Question 2 — 14 marks

A Complete the following :

1. From the teethless mammals are .... and ....
(St.Mark Sch. / Minia 2022, El-Gharbia 2020)

2. Arthropods can be classified according to the number of legs into .... , ... and .... *(Al-Manar Sch. / Ismailia 2020)*

3. The front limbs of dolphins are modified into .... to take the role of .... *(Egypt Dream Sch. / Giza 2020)*

4. .... insect looks like the leaf of the plant.

B **Choose the odd word out, then write the scientific term of others :**

1. Leaf insect – Stick insect – Chameleon – Elodea plant.
2. Dinosaur – Desert snail – Jerboa – Frog.
3. Shrimp – Mussel – Snail – Fish.
4. Cockroach – Flies – Spider – Mosquito. *(Beni Suef 2020)*

The odd word	The scientific term
1.	....
2.	....
3.	....
4.	....

C **Mention one difference between :** Rabbit and squirrel. *(El-Kharga / New Valley 2022)*

Rabbit	Squirrel
....	....
....	....
....	....

Question 3 *14 marks*

A **Write the scientific term of each of the following :**

1. A set of similar animals in their shape and can get mated together to produce fertile individuals. *(El-Menofia 2020)* (..........................)
2. The ability of some living organisms to be hidden from enemies or to capture the preys. *(Egypt Dream Sch. / Giza 2020)* (..........................)
3. The branch of biology that searches for the similarities and the differences among living organisms. *(Egypt Dream Sch. / Giza 2020)* (..........................)
4. Hiding of some animals in burrows to avoid low temperature in winter. *(East Zone / Alex. 2020)* (..........................)

B **Choose from column (B) what suits it in column (A) :** *(Alex. Sch. / Alex. 2020)*

(A)	(B)
1. Chameleon	a. reproduces by formation of spores.
2. Vougheir	b. undergoes aestivation in summer to escape from high temperature.
3. Drosera	c. colours itself with the dominant colour of the environment.
4. Jerboa	d. is from insectivorous plants.
	e. reproduces by formation of seeds.

1. (..........) 2. (..........) 3. (..........) 4. (..........)

C **What is the importance of the front teeth of hedgehog ?** *(Alex. Sch. / Alex. 2020)*

....

Question 4 14 marks

A **Put (✓) or (×), then correct what is wrong :**

1. Angiosperms are called flowering plants. *(Al-Qalyoubia 2022, El-Menofia 2020)*
   ( ) ....
2. Secretion of sweat in human is a type of adaptation. *(Alex. Sch. / Alex. 2020)*
   ( ) ....
3. Human belongs to one species although he differs in colour or race or home.
   ( ) ....
   (Al-Mostaqbal Sch. / Aswan 2020)
4. Insectivorous plants can't absorb the nitrogenous substances that make fats.
   ( ) ....
   (Al-Mostaqbal Sch. / Aswan 2020)

B **Look at the opposite figures which show two micro-organisms, then complete :**

1. The name of the organism (A) is ...., and the name of organism (B) is ....
2. Organism (A) moves by ...., while organism (B) moves by ....

(A) (B)

C **Your classmate has seen a bird. He doesn't know the name of this bird but he has managed to describe it as a bird with a sharp beak and the legs end in fingers with strong claws.** *(Suez 2022)*

According to your classmate story. Answer the following questions.

1. What is the type of adaptation in both the beak and leg of this bird ?
   ....
2. How many fingers are in each leg ?
   ....
3. What type of food does this bird feed on ?
   ....

PART 2

Final Revision

Unit One : Matter and its Construction.

Unit Two : Energy.

Unit Three : Diversity and Adaptation in Living Organisms.



Final Revision on Unit 1

1 Definitions (or scientific terms) :

1. Matter :	- It is anything that has a mass and a volume. - It is anything that has a mass and occupies a space.
2. Mass :	It is the amount of matter that the body contains.
3. Volume :	It is the space that is occupied by the body.
4. Density :	- It is the mass of unit volume of a substance. - It is the mass of one cubic centimetre of a substance.
5. Melting point :	It is the temperature at which the matter begins to change from the solid state to the liquid state.
6. Boiling point :	It is the temperature at which the matter begins to change from the liquid state to the gaseous state.
7. Molecule :	It is the smallest part of matter which can exist freely and it has the properties of matter.
8. Intermolecular spaces :	The spaces that are found among the molecules of matter.
9. Intermolecular force :	The force that binds the molecules of matter together.
10. Melting process :	It is the change of matter from a solid state to a liquid state by heating.
11. Vaporization process :	It is the change of matter from a liquid state to a gaseous state by heating
12. Element :	It is the simplest pure form of matter which can't be analyzed chemically into simpler form by simple chemical methods.
13. Compound :	It is a substance which is formed from the combination of atoms of two or more different elements with constant weight ratios.
14. The atom :	- It is the fundamental building unit of matter. - It is the smallest individual unit of matter which can share in chemical reactions.
15. Atomic number :	- It is the number of protons in the nucleus of an atom. - It is the number of electrons that rotate around the nucleus.
16. Mass number :	It is the sum of the numbers of protons and neutrons in the nucleus of an atom.
17. Energy levels :	They are imaginary regions (places) around the nucleus in which the electrons move according to their energies.

18. Quantum :	It is the amount of energy lost or gained by an electron when it transfers from one energy level to another.
19. Excited atom :	It is the atom that gains a quantum of energy.

2 What is meant by ... ?

1. The density of natural milk = 1.03 gm/cm^3 :	The mass of one cubic centimetre (1cm^3) of natural milk is 1.03 gm.
2. The density of water = 1 gm/cm^3 :	The mass of one cubic centimetre (1cm^3) of water is 1 gm.
3. The melting point of ice = 0°C :	The ice begins to change into water at 0°C.
4. The boiling point of water = 100°C :	The water begins to change into water vapour at 100°C.
5. The atomic number of lithium atom is 3 :	The number of protons inside the nucleus of lithium atom equals 3
6. The mass number of oxygen atom is 16 :	The sum of the numbers of protons and neutrons in the nucleus of oxygen atom equals 16

3 Importance and uses :

1. Density :	- It is used in determination of purity of some substances. - It is used in determination of the ability of substances to float or sink in water.
2. Hydrogen & helium gases :	They are used in filling balloons of celebrations.
3. Silver, gold, platinum & copper-gold alloy :	They are used in making jewels.
4. Nickel-chrome alloy :	It is used in making heating coils.
5. Stainless steel or aluminium :	It is used in the manufacture of cooking pans (pots).
6. Copper :	It is used in making electric wires or cables.
7. Wood or plastic :	It is used in making the handles of cooking pans or screwdrivers.

8. Nickel, gold and silver :	They are used to cover other substances to protect them from corrosion
9. Grease :	It is used to protect metallic spare parts of cars from rust and corrosion.
10. The chemical symbols of elements :	They are used to express element easily.
11. Electrons of the outermost energy level :	They are responsible for the chemical reactions.

4 Life applications :

1. Applications on density :

- Water is not used to put out petrol fires.
- Balloons filled with hydrogen or helium rise up in air carrying flags during festivals.
- Determination of the quality of milk.

2. Applications on melting point :

- Workmen melt the solid metals to be easy for mixing and shaping to form alloys as copper-gold alloy.
- Cooking pans are made up of aluminium or stainless steel alloy which doesn't rust as they have high melting points.

3. Application on boiling point :

- The separation of the components of crude petroleum oil by heating depends on the difference between them in their boiling points.

4. Applications on hardness :

- The screwdrivers are made up of steel iron.
- The rods used in building concrete houses are made up of iron.

5. Applications on electric conduction :

- Electric wires or cables are made up of copper or aluminium and they are covered by a plastic layer.
- Electric screwdrivers are made up of steel iron, while their handles are made up of wood or plastic.

6. Applications on thermal conduction :

- Cooking pans are made up of aluminium or stainless steel alloy which doesn't rust.
- Handles of cooking pans are made up of wood or plastic.

7. Applications on chemical activity of metals :

A. Application on very active metals :

- Sodium and potassium are kept under kerosene surface.

B. Applications on less active metals :

- Steel bridges and the holders of light bulbs are painted from time to time.
- Metallic spare parts of cars are covered with grease.
- Washing cooking pans which are made up of aluminium with a rough material.

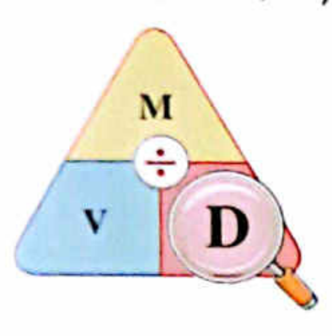
C. Applications on inactive metals :

- Silver, gold and platinum are used in making jewels.
- Nickel, gold and silver are used to cover other substances which rapidly gain rust.

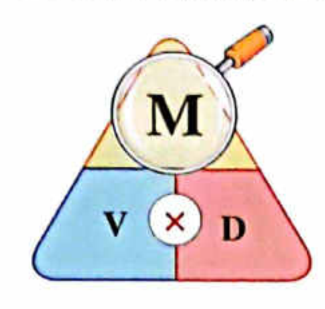
5 Laws and solved problems :

1. Density (D) = $\frac{\text{Mass (M)}}{\text{Volume (V)}}$ ⟶ gm /cm^3 = $\frac{gm}{cm^3}$

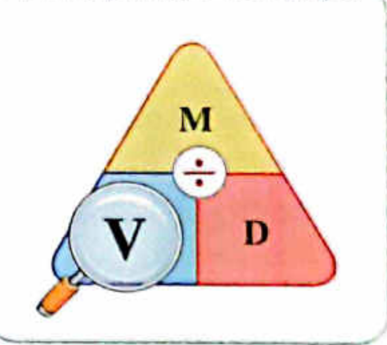
To find the density



To find the mass



To find the volume



Problems

1 ***Calculate the mass of a piece of sulphur, whose volume is 5 cm^3, knowing that the density of sulphur is 2.1 gm/cm^3.***

Solution

$M = V \times D = 5 \times 2.1 = 10.5$ gm.

2 ***If you have two cubes (A) & (B) of wood, whose density is 0.5 gm/cm^3. Calculate :***

a. The mass of cube (A) knowing that its volume is 50 cm^3.

b. The volume of cube (B) knowing that its mass is 10 gm.

Solution

a. The mass of cube A (M) = D × V = 0.5 × 50 = 25 gm.

b. The volume of cube B (V) = $\frac{M}{D} = \frac{10}{0.5} = 20$ cm^3

3 ***In an experiment for determining the density of water, the following results are recorded.***

- **The mass of an empty beaker = 65 gm.**
- **The mass of the beaker and water = 165 gm.**
- **The volume of water = 100 cm^3.**

Calculate the density of water.

Solution

The mass of water = The mass of the beaker and water – The mass of the empty beaker
= 165 – 65 = 100 gm.

The density of water (D) = $\frac{M}{V} = \frac{100}{100}$ = 1 gm/cm^3.

4 ***On determining iron density using a piece of iron of mass is 78 gm, the piece is immersed in 100 cm^3 of water, the water increases up to 110 cm^3. Find the density of iron.***

Solution

The volume of the iron piece =
The volume of water and the iron piece – The volume of water = 110 – 100 = 10 cm^3.
The density of the iron piece (D) = $\frac{M}{V} = \frac{78}{10}$ = 7.8 gm/cm^3.

2. • Atomic no. = No. of protons = No. of electrons
   • Mass no. = No. of protons (Atomic no.) + No. of neutrons
   ∴ Number of neutrons = Mass number – Atomic number

3. The number of electrons which saturates the first four energy levels can be calculated from the relation ($2n^2$), where (n) is the number of the energy level.
   This rule is applied only on the first four energy levels [K , L , M and N].
   - No. of electrons which saturates the (K) level = $2 \times (1)^2$ = 2 electrons
   - No. of electrons which saturates the (L) level = $2 \times (2)^2$ = 8 electrons
   - No. of electrons which saturates the (M) level = $2 \times (3)^2$ = 18 electrons
   - No. of electrons which saturates the (N) level = $2 \times (4)^2$ = 32 electrons

Problem

If you are given the symbol of chlorine atom is ($^{35}_{17}Cl$).

a. Calculate the atomic number, mass number and number of neutrons.

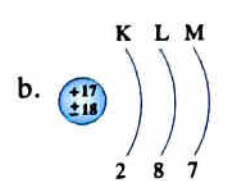
b. Write the electronic configuration of the atom.

Solution

a. • Atomic number = 17

• Mass number = 35

• Number of neutrons = Mass no. – Atomic no. = 35 – 17 = 18

b. 

6 Important tables :

① Physical properties which are used to distinguish between substances and each others :

Physical property	Used to distinguish between
• **Colour :**	Gold, iron and silver.
• **Taste :**	Sugar, table salt and flour.
• **Odour (Smell) :**	Perfume and vinegar.
• **Density :**	- Substances float on water surface as their densities are less than the density of water, as : Ice, cork and wood. - Substances sink in water as their densities are more than the density of water, as : Iron, metallic coin and copper.
• **Melting point :**	- Substances have low melting points, as : Wax, butter and ice. - Substances have high melting points, as : Iron, copper, aluminium and table salt.
• **Boiling point :**	Components of petroleum oil and separation of them from each other.
• **Hardness :**	- Rubber is soft at room temperature. - Metals are soft by heating. - Coal and sulphur don't soft by heating.
• **Electric conduction :**	- Good conductors of electricity, as : Acidic solutions, alkaline solutions, some salt solutions and metals as iron, silver, copper, ... - Bad conductors of electricity, as : Gases, sugary solution, solution of hydrogen chloride in benzene, sulphur, phosphorus, wood and plastic.
• **Thermal conduction :**	- Good conductors of heat, as : Copper, iron, aluminium, ... - Bad conductors of heat, as : Wood and plastic.

2 Molecules of some elements and compounds :

Molecule	Its kind	No. and type of atoms	Illustrating figure
1. Oxygen molecule :	Element molecule	Two similar atoms (two oxygen atoms).	
2. Hydrogen chloride molecule :	Compound molecule	Two different atoms (one hydrogen atom & one chlorine atom).	
3. Water molecule :	Compound molecule	Three atoms of two different elements (two hydrogen atoms & one oxygen atom).	
4. Ammonia molecule :	Compound molecule	Four atoms of two different elements (three hydrogen atoms & one nitrogen atom).	

3 The chemical symbols of some elements :

H	Hydrogen	Cl	Chlorine	He	Helium	Ar	Argon	Li	Lithium
K	Potassium	C	Carbon	Ca	Calcium	N	Nitrogen	Fe	Iron
O	Oxygen	Cu	Copper	F	Fluorine	Zn	Zinc	Ne	Neon
Br	Bromine	Na	Sodium	Ag	Silver	Mg	Magnesium	I	Iodine
Al	Aluminium	Au	Gold	Si	Silicon	Hg	Mercury	P	Phosphorus
Pb	Lead	S	Sulphur	B	Boron	Be	Beryllium	Cr	Chromium

4 The electronic configuration of some atoms and chemical activity :

Atom of element	Symbol	Atomic no.	Mass no.	Electronic configuration	Structure of the atom	Chemical activity
1. Hydrogen (The simplest atom)	$^{1}_{1}H$	1	1	Energy level — K +1 Electron — 1	- No. of protons = 1 - No. of neutrons = 0 - No. of electrons = 1 (orbits in "K" level).	**Active** As its outermost energy level has (1 electron).
2. Helium	$^{4}_{2}He$	2	4	K +2 ±2 2	- No. of protons = 2 - No. of neutrons = 2 - No. of electrons = 2 (orbit in "K" level).	**Inactive** As its outermost energy level is completely filled with electrons (2 electrons).
3. Oxygen	$^{16}_{8}O$	8	16	K L +8 ±8 2 6	- No. of protons = 8 - No. of neutrons = 8 - No. of electrons = 8 (2 orbit in "K" level and 6 in "L" level).	**Active** As its outermost energy level has (6 electrons).
4. Argon	$^{40}_{18}Ar$	18	40	K L M +18 ±22 2 8 8	- No. of protons = 18 - No. of neutrons = 22 - No. of electrons = 18 (2 orbit in "K" level, 8 in "L" level and 8 in "M" level).	**Inactive** As its outermost energy level is completely filled with electrons (8 electrons).
5. Potassium	$^{39}_{19}K$	19	39	K L M N +19 ±20 2 8 8 1	- No. of protons = 19 - No. of neutrons = 20 - No. of electrons = 19 (2 orbit in "K" level, 8 in "L" level, 8 in "M" level and 1 in "N" level).	**Active** As its outermost energy level has (1 electron).

7 Give reasons for :

1. Air is considered as matter.

Because air has a mass and occupies a certain space.

2. Colour, taste and odour can't be used to differentiate between water and oxygen gas.

Because both of water and oxygen gas are colourless, tasteless and odourless.

3. The mass of 1 cm^3 of iron is higher than that of 1 cm^3 of wood.

Because the density of iron is more than that of wood.

4. • Equal masses of different substances have different volumes.

• Equal volumes of different substances have different masses.

Due to the difference in density.

5. A piece of wood floats on water surface, while a piece of lead sinks in it.

Because the density of wood is less than that of water, while the density of lead is more than that of water.

6. An iron nail sinks in water, while one kilogram of cork floats on its surface.

Because the density of iron is more than that of water, while the density of cork is less than that of water.

7. Ice floats on water surface, although they are different states of the same matter.

Because the density of ice is less than that of water.

8. Water isn't used to put out petrol fires.

Because the density of petrol is less than that of water so, petrol floats on water surface and water doesn't put out the petrol fires.

9. Balloons filled with hydrogen or helium rise up in the air carrying flags during festivals.

Because the densities of hydrogen and helium are less than the density of air.

10. A piece of ice changes into water after a period of time when it is left in air.

Because the melting point of ice is low.

11. Workmen melt the solid metals.

To be easy for mixing and shaping to form alloys as copper-gold alloy.

12. It's easy to shape metals, while it's difficult to shape coal.

Because metals become soft by heating, so it's easy to shape them, while coal doesn't become soft by heating, so it's difficult to shape it.

13. Iron rods not copper rods are used in building concrete houses.

Because the hardness of iron is more than that of copper.

14. Electric wires (or cables) are made up of copper or aluminium and they are covered by a plastic layer.

Because copper and aluminium are good conductors of electricity, while plastic is a bad conductor of electricity.

15. An electrician uses a screwdriver made up of steel iron with a plastic handle.

Because steel iron is very hard and a good conductor of electricity, while plastic is a bad conductor of electricity.

16. Cooking pans are made up of aluminium or stainless steel alloy which doesn't rust.

Because they are good conductors of heat and they have high melting point.

17. Handles of cooking pans are made up of wood or plastic.

Because each of them is a bad conductor of heat.

18. Active metals such as sodium lose their metallic luster when they are exposed to moist air.

Because they react easily with atmospheric oxygen.

19. Potassium and sodium are kept under kerosene surface.

To prevent their reaction with atmospheric oxygen as they are active metals.

20. • Steel bridges and the holders of light bulbs are painted from time to time.

• Metallic spare parts of cars are covered with grease.

• Some metallic pitchers are covered with a layer of silver.

To protect them from rust and corrosion.

21. Cooking pans made up of aluminium are washed with a rough material.

To remove the rust layer formed on their surfaces.

22. Silver, gold and platinum are used in making jewels.

Because they are chemically poor active.

23. The odour of perfume spreads all over the room when the bottle is opened.

Because the molecules of the perfume are in a continuous motion and they keep the properties of the perfume.

24. • A drop of ink spreads through water.

• When we put a small amount of potassium permanganate in a glass containing water, the colour of water changes into violet.

Because the molecules of ink or potassium permanganate are in a continuous motion in all directions among water molecules.

25. • **Disappearance of a little amount of table salt when it is put in a beaker containing water for a period of time.**

• **Disappearance of sugar when it is dissolved in water.**

Because when the table salt or sugar dissolves in water, the molecules of table salt or sugar spread in the intermolecular spaces among water molecules.

26. • **The volume of a mixture of water and alcohol is less than the sum of their volumes before mixing.**

• **On adding 300 cm^3 of water to 200 cm^3 of alcohol, it was found that their volumes together became less than 500 cm^3.**

Because some molecules of alcohol occupy the intermolecular spaces among water molecules.

27. **It is difficult to break down a piece of iron with your hand.**

Because there are strong attraction forces among iron molecules.

28. **It is easy to divide an amount of water into small parts.**

Because there are weak attraction forces among water molecules.

29. **The solid substances keep their shape whatever the container shape differs, while the liquid takes the shape of its container.**

Because in solid substances the intermolecular spaces among their molecules are very narrow and the intermolecular force is very strong, so the molecules are relativety fixed in their positions, while in liquid the intermolecular spaces among its molecules are relativity large and the intermolecular force among its molecules is weak, so it takes the shape of its container.

30. **Gases have indefinite shapes and volumes.**

Because the intermolecular spaces among their molecules are very large and the intermolecular force among their molecules is very weak.

31. **The matter changes from solid state to liquid state by heating.**

Because by heating, solid molecules gain thermal energy, so their speed increases and at the melting point, the intermolecular forces weaken, so the intermolecular spaces increase and they become more freely leading to the change of matter from the solid state into the liquid state.

32. • **When water gains energy, it converts into gas.**

• **The matter changes from liquid state into gaseous state by heating.**

Because when a liquid substance is heated, its molecules gain more energy and their speed increases and at the boiling point, the molecules overcome the intermolecular forces and the intermolecular spaces increase, so they escape in the form of vapour.

33. Molecules of elements differ from molecules of compounds.

Because molecule of an element consists of similar atoms, but molecule of a compound consists of different atoms.

34. Oxygen is an element, while hydrogen chloride is a compound.

Because oxygen molecule is formed of two similar atoms, while hydrogen chloride molecule is formed of two different atoms.

35. The molecule of helium differs from the molecule of hydrogen.

Because helium is an inert gas and its molecule is monoatomic, while hydrogen is active gas and its molecule is diatomic.

36. The properties of molecules of substances are different from each other.

Because molecules of various substances differ from each other in :

a. number of atoms.

b. kind of atoms.

c. way of combination between atoms.

37. Carbon is symbolized by one letter, while calcium is symbolized by two letters.

Because the name of each of them starts with letter (C) so, (C) is chosen as the symbol of carbon and (Ca) is the symbol of calcium.

38. The symbol of sodium is (Na) not (So) as it is expected.

Because the symbol is derived from Latin name, so that the symbol of this element differs from its name in English language.

39. The atom is electrically neutral.

Because the number of negative electrons which revolve around the nucleus is equal to the number of positive protons in the nucleus.

40. The mass of the atom is concentrated in the nucleus.

Because the electron has a negligible mass relative to that of the proton or neutron.

41. The nucleus has a positive charge.

Because it contains protons which are positively charged and neutrons which are electrically neutral.

42. The mass number is usually greater than the atomic number.

Because the mass number is the sum of numbers of protons and neutrons inside the nucleus, while atomic number equals the number of protons only.

43. In hydrogen atom, the atomic number equals the mass number.

Because hydrogen atom doesn't contain neutrons, so the mass number = the atomic number = the number of protons.

44. The electrons are distributed to fill (K) level before filling (L) level.

Because the energy of (K) level is less than that of (L) level.

45. • The energy level (M) in the atom isn't occupied by more than 18 electrons.

• The third energy level in the atom is saturated by 18 electrons.

Because the energy levels are saturated with electrons according to the relation ($2n^2$), so the number of electrons in this level = $2 \times (3)^2 = 18$ electrons.

46. The rule ($2n^2$) is not applied on the energy levels greater than four.

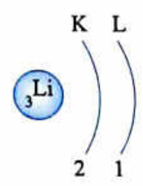
Because the atom becomes unstable if the level contains more than 32 electrons.

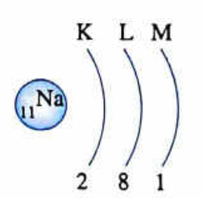
47. The number of electrons in the outermost energy level determines the chemical activity of the element.

Because if the outermost energy level contains 8 electrons, so the element is inactive (inert), while if the outermost energy level contains less than 8 electrons, so the element is active.

48. The number of electrons in the outermost energy level in lithium atom ($^{7}_{3}Li$) is equal to that of sodium atom ($^{23}_{11}Na$).

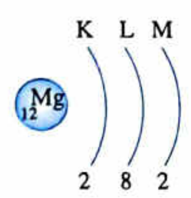
Because both of them have one electron in the outermost energy level.

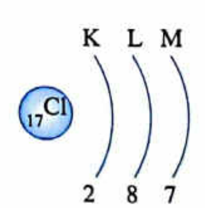




49. The electrons of ($_{12}Mg$) and ($_{17}Cl$) are distributed in the same number of energy levels

Because both of them have three energy levels.





50. Atoms of active elements take part in the chemical reaction.

To form stable molecules.

51. • Inert gases can't share in chemical reactions in ordinary state.

• The atoms of inert gases are stable.

Because the outermost energy level of their atoms are completely filled with electrons.

52. Neon atom ($^{20}_{10}Ne$) doesn't take part in the chemical reaction, while nitrogen atom ($^{14}_{7}N$) takes part in the chemical reaction.

Because in ($^{20}_{10}Ne$) atom, the outermost energy level is saturated with 8 electrons, while the outermost energy level in ($^{14}_{7}N$) atom contains 5 electrons and it tends to complete it to produce stable molecule.

53. Sodium atom is active , while argon is inactive.

Because the outermost energy level of sodium atom is not completely filled with electrons (contains one electron), while the outermost energy level of argon atom is completely filled with electrons (contains 8 electrons).

8 What happens when ... ?

1. • **Increasing the mass of a body to double, according to its density.**
   • **Decreasing the volume of a body to half, according to its density.**
   The density remains constant.
2. **Putting of a piece of cork and a metallic coin in water.**
   The piece of cork floats on water surface, while the metallic coin sinks in it.
3. **Using of water in putting out petrol fires.**
   The petrol floats on water surface, so the fires don't put out.
4. **Heating of a piece of coal.**
   It can't be soften by heating.
5. **Iron nail moisten by water is exposed to air for several days and why ?**
   It rusts due to its reaction with atmospheric oxygen.
6. **Leaving steel bridges and the holders of light bulbs without paint.**
   They will rust and corrode.
7. **Leaving of some metals exposed to air for a long time and why ?**
   Their luster disappears due to their reaction with atmospheric oxygen.
8. **Opening of a perfume bottle in a closed room for a while.**
   The odour of the perfume spreads all over the room.
9. **Putting of some table salt in a beaker containing water.**
   The molecules of table salt spreads through the intermolecular spaces among water molecules.
10. **Putting of a drop of ink in water.**
    The colour of ink spreads through all the water.
11. **You add 50 cm^3 of ethyl alcohol to 100 cm^3 of water.**
    The volume of the mixture will be less than 150 cm^3.
12. **You try to break a piece of iron with your hand.**
    You can't break the iron piece as the attraction force among its molecules is very hard.

13. Heating of a piece of solid matter for a long time to its melting point.

Its molecules gain thermal energy, so their speed increases and at the melting point, the intermolecular force weaken, so the intermolecular spaces increase, and they become more freely leading to the change of matter from the solid state into liquid state.

14. Heating of some water in a beaker to its boiling point.

Its molecules gain thermal energy and their speed increases and at the boiling point some of them overcome the intermolecular forces and the intermolecular spaces increase, so they escape in the form of vapour.

15. Three atoms of hydrogen combine with one atom of nitrogen.

Ammonia molecule is formed.

16. The nucleus of an atom of an element doesn't contain neutrons.

Its atomic number is equal to its mass number.

17. The number of protons changes.

The value of the positive charge changes, and the values of the atomic number and mass number change so, the element changes into another element.

18. • The electron gains a quantum of energy.

- **The energy of the electron becomes more than the energy of the level in which the electron rotates.**
- **The electron gains some energy which equals to the difference between the energies of two levels.**

It transfers to a higher energy level and the atom becomes excited atom.

19. An excited electron loses a quantum of energy.

The electron returns back to its original energy level and the atom returns to its original (ground) state.

20. The outermost energy level of an atom isn't completely filled with electrons.

The atom will react chemically with another atom or more than one atom to produce a molecule in a stable state.

9 Comparisons :

1 Iron and wax :

Points of comparison	Iron	Wax
• Density related to water :	More than the density of water.	Less than the density of water.
• Melting point :	High.	Low.

2 Copper and plastic :

Points of comparison	Copper	Plastic
• Electric conduction :	Good conductor of electricity.	Bad conductor of electricity.
• Thermal conduction :	Good conductor of heat.	Bad conductor of heat.

3 Rubber, aluminium and sulphur :

Points of comparison	Rubber	Aluminium	Sulphur
• Hardness :	Soft at room temperature.	Soft by heating.	Doesn't soft by heating.
• Electric conduction :	Bad conductor of electricity.	Good conductor of electricity.	Bad conductor of electricity.

4 Very active metals, less active metals and inactive metals :

Points of comparison	Very active metals	Less active metals	Inactive metals
• Chemical activity :	They are metals which react with oxygen as soon as being exposed to humid air.	They are metals which react with oxygen if they are left in air for some days forming a layer of rust.	They are metals which find great difficulty in reacting with oxygen.
• Examples :	Sodium and potassium.	Iron, aluminium and copper.	Gold, silver, platinum, nickel and chromium.

5 Melting process and vaporization process :

Points of comparison	Melting process	Vaporization process
• Definition :	It is the change of matter from a solid state to a liquid state by heating.	It is the change of matter from a liquid state to a gaseous state by heating.
• Example :	The change of ice into water.	The change of water into water vapour.

6 The three states of matter :

Points of comparison	The solid state	The liquid state	The gaseous state
• Motion of molecules :	Limited motion (vibrational motion).	More free (intermediate).	Completely free (unlimited).
• Intermolecular spaces :	Very small (narrow).	Intermediate (relatively large).	Very large.
• Intermolecular forces :	Very strong.	Intermediate (relatively weak).	Very weak (vanishing) or almost not existed.
• Volume :	Definite (fixed).	Definite.	Indefinite (variable).
• Shape :	Definite.	Indefinite.	Indefinite.
• Examples :	• Ice. • Iron. • Aluminium.	• Water. • Alcohol. • Oil.	• Water vapour. • Oxygen. • Carbon dioxide.

7 Element and compound :

Points of comparison	Element	Compound
• Definition :	It is the simplest pure form of matter which can't be analyzed chemically into simpler form by simple chemical methods.	It is a substance which is formed from combination of atoms of two or more different elements with constant weight ratios.
• Atoms :	Similar.	Different.
• Examples :	Hydrogen, oxygen, aluminium and sulphur.	Water, carbon dioxide, hydrogen chloride and ammonia.

8 Bromine and mercury :

Bromine	Mercury
A liquid nonmetal element.	A liquid metal element.
Its molecule consists of two atoms.	Its molecule consists of one atom.

9 Sodium, bromine and neon :

Points of comparison	Sodium	Bromine	Neon
• Chemical activity :	Active	Active	Inactive (inert gas)
• Physical state :	Solid	Liquid	Gas
• Number of atoms of the molecule :	One atom	Two atoms	One atom

10 Water molecule and ammonia molecule :

Points of comparison	Water molecule	Ammonia molecule
• **The type of the molecule :**	It is a compound molecule.	It is a compound molecule.
• **The structure of the molecule :**	It consists of two hydrogen atoms and one oxygen atom.	It consists of one nitrogen atom and three hydrogen atoms.
• **The no. of atoms forming it :**	Three atoms.	Four atoms.

11 Atomic number and mass number :

Atomic number	Mass number
It is the number of protons in the nucleus of an atom.	It is the sum of the numbers of protons and neutrons inside the nucleus of an atom.
It is written at the left side below the symbol.	It is written at the left side above the symbol.

12 Constituents of the atom :

Points of comparison	Proton	Neutron	Electron
• **Position :**	In the nucleus.	In the nucleus.	Revolves around the nucleus.
• **Charge :**	Positive (+)	Neutral (±)	Negative (−)
• **Mass :**	Very large compared to electron mass.	Very large compared to electron mass.	Very small (negligible) compared with proton or neutron mass.

13 Active elements and inactive elements :

Active elements	Inactive (Inert) elements
• The outermost energy level contains less than 8 electrons.	• The outermost energy level is completely filled with 8 electrons (except He).
• Atoms of active elements (unstable) take part in chemical reactions to produce stable molecules.	• Atoms of inactive elements (stable) don't take part in chemical reactions in ordinary conditions because the outermost energy levels are completely filled with electrons.
• **Example :** Sodium ($^{23}_{11}Na$) K L M Na 2 8 1	• **Example :** Argon ($^{40}_{18}Ar$) K L M Ar 2 8 8

11 **Aluminium atom ($^{27}_{13}Al$) and argon atom ($^{40}_{18}Ar$) :**

Points of comparison	Aluminium atom ($^{27}_{13}Al$)	Argon atom ($^{40}_{18}Ar$)
• Atomic no. :	13	18
• Mass no. :	27	40
• No. of protons :	13	18
• No. of neutrons :	14	22
• Electronic configuration :	K L M (+13, ±14) 2 8 3	K L M (+18, ±22) 2 8 8
• No. of electrons in the outermost level :	3	8
• Chemical activity :	Active	Inactive (Inert gas)

10 Activities :



• To distinguish between substances by density :
• To compare between the density of some substances and water :

Tools :



• A basin containing water.
• Drops of oil.
• Pieces of (ice, cork, wood, iron nail, and metallic coin).

Step :

Put all of the previous substances in the basin.

Observation :

Ice, cork, wood and oil float on water surface, while iron and metallic coin sink in it.

Conclusions :

1. Materials which have density higher than that of water sink in it.
2. Materials which have density lower than that of water float on its surface.



Activity (2) To differentiate between different substances by the point of fusion (melting point) :

Steps :

1. In a hot water bath, put a beaker containing crushed ice and a thermometer.
2. Record the reading at which the ice starts to melt.
3. Replace the crushed ice by wax and repeat the previous steps.



Observation :

The melting point of ice is less than that of wax.

Conclusion :

Each substance has a definite melting point.

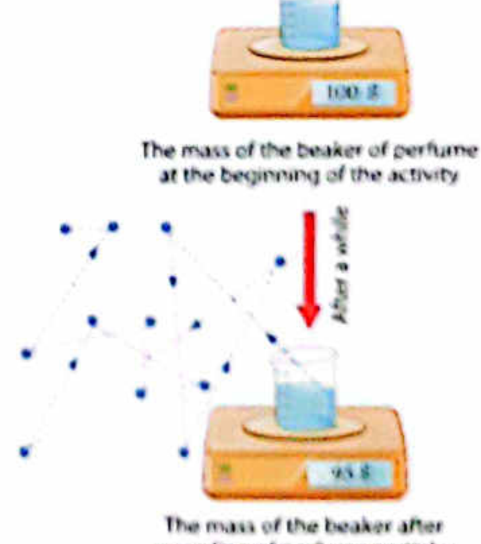


Activity (3)

- **To show that the matter is composed of molecules :**
- **Molecule is the building unit of matter :**

Steps :

1. Put a suitable amount of perfume in a glass beaker, then determine its mass by using a digital balance.
2. Leave the beaker in one side of the room for a period of time, then move to the other side of the room.
3. Determine the mass of the beaker again.



The mass of the beaker of perfume at the beginning of the activity

The mass of the beaker after spreading of perfume particles

Observations :

- The odour of the perfume spreads all over the room.
- The mass of the beaker decreases.

Conclusion :

The matter of the perfume is divided into smaller parts called **molecules** which keep the properties of the perfume, so the **molecule** is the building unit of matter.



Activity 4 To prove that the molecules of matter are in a state of continuous motion :

Step :

Put a small quantity of potassium permanganate in a glass beaker containing water.

Observation :

The violet colour of potassium permanganate spreads through all the water.

Conclusion :

The molecules of matter are in a state of continuous motion.



Activity 5 To prove the presence of intermolecular spaces among the molecules of matter :

Step :

Put 300 cm^3 of water in a graduated cylinder, then add 200 cm^3 of alcohol to it.

Observation :

The volume of the mixture will be less than 500 cm^3.

Conclusion :

There are intermolecular spaces among the molecules of matter (water), in which some molecules of alcohol spread in these intermolecular spaces.



Activity 6 To prove the presence of intermolecular forces among the molecules of matter :

Steps :

1. Try to break (fragmantize) an iron piece with your fingers or by hammering it.
2. Try to divide an amount of water in small cups.

Observations :

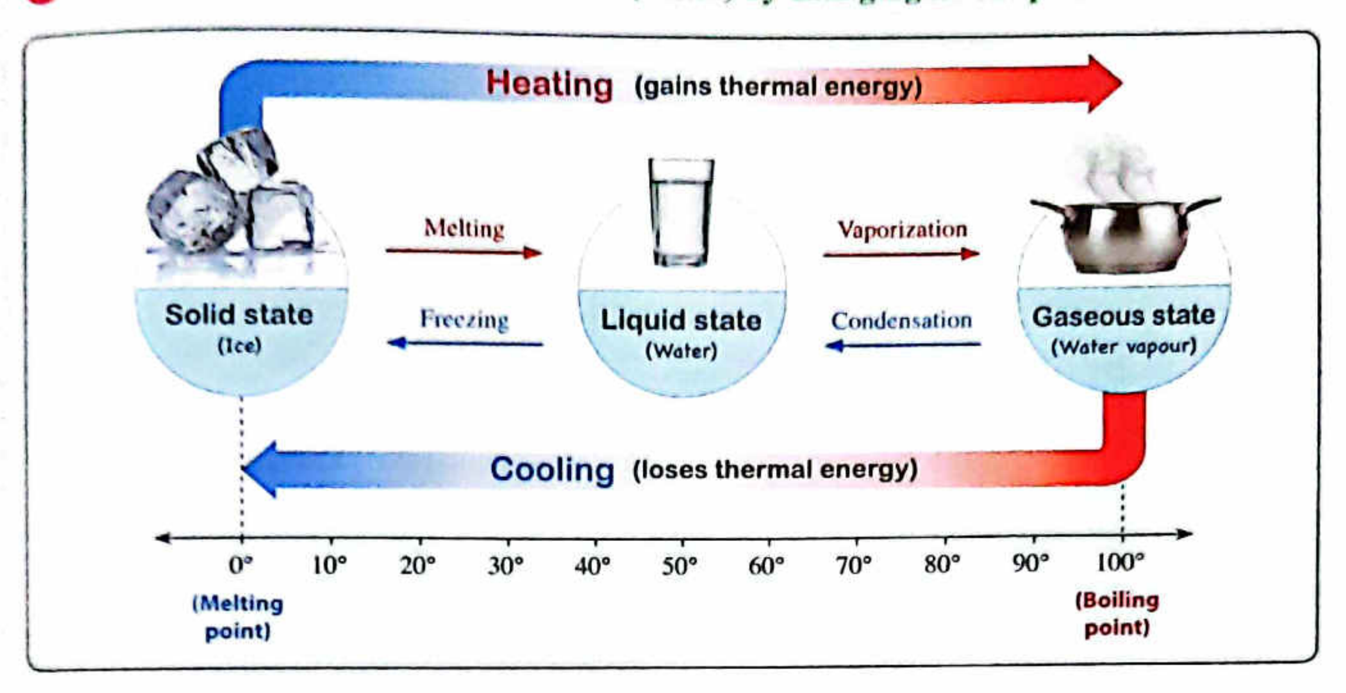
1. It is difficult to break the iron piece.
2. It is easily to divide the water into portions.

Conclusion :

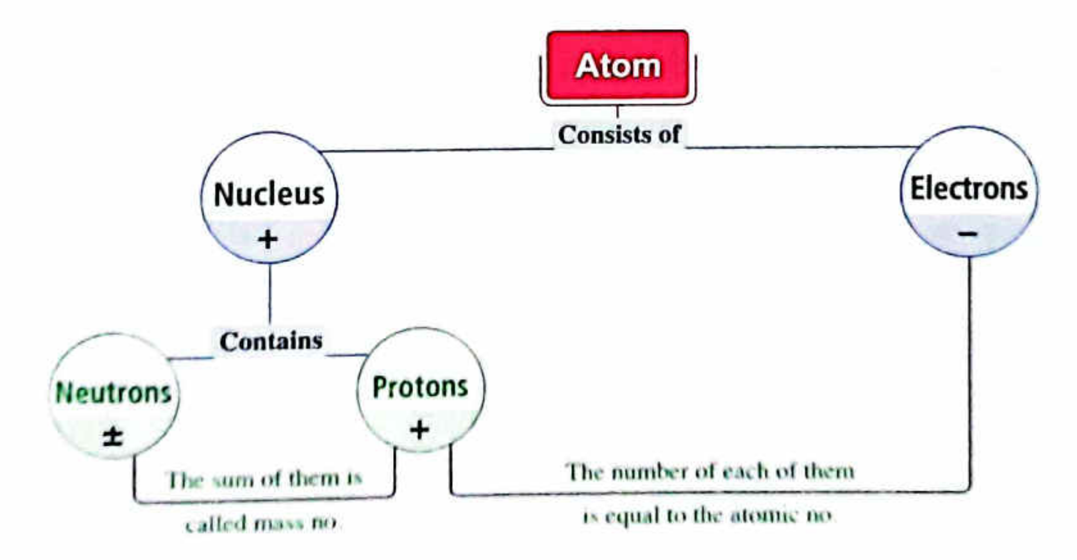
It is difficult to break a piece of iron, because the attraction forces among molecules are very strong in solids (such as iron), while it is easily to divide water because these forces are weak in liquids (such as water).

11 Important diagrams :

1 Diagram shows the changes of matter (water) by changing its temperature :



2 Diagram shows the atomic construction :



Final Revision  Unit 2

1 Definitions (or scientific terms):

1. Energy :	It is the ability to do work or to make a change.
2. Potential energy :	It is the energy stored in the object due to the work done on it.
3. Kinetic energy :	It is the work done during the motion of an object.
4. Mechanical energy :	It is the sum of potential and kinetic energies of the body.
5. The law of conservation of energy :	Energy is neither created nor destroyed, but it is converted from one form to another.
6. Heat energy :	It is a form of energy which is transferred from a higher temperature object to a lower temperature object.
7. Temperature :	It is the heat condition which determines the direction of heat energy whether from or to the object when it comes in contact with another.
8. Transfer of heat by conduction :	It is the transfer of heat through some solid objects from the part with higher temperature to that with lower temperature.
9. Transfer of heat by convection :	It is the transfer of heat in gases and liquids, where hot molecules which have less density rise upwards, while colder molecules which have more density fall down.
10. Transfer of heat by radiation :	It is the transfer of heat from a hot object to another without any need for a material medium through which heat transfers.

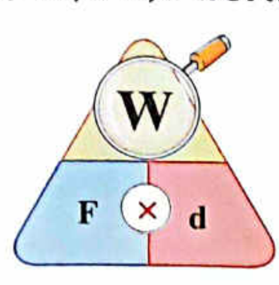
2 What is meant by ... ?

1. The potential energy of an object = 20 joule.	The energy stored in the object due to the work done on it is 20 joule.
2. The potential energy of an object = zero.	The object is placed on the ground.
3. The kinetic energy of an object = 90 joule.	The work done during the motion of the object is 90 joule.
4. The kinetic energy of an object = zero.	The object is at rest (its speed is zero).
5. The mechanical energy of a moving body = 100 joule.	The sum of potential and kinetic energies of the body is 100 joule.

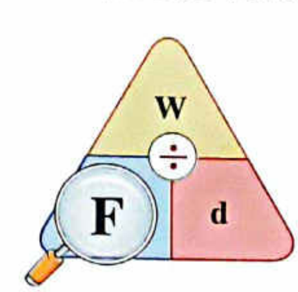
3 Laws and solved problems :

1. Work (W) = Force (F) × Displacement (d)
«Joule» «Newton» «Metre»

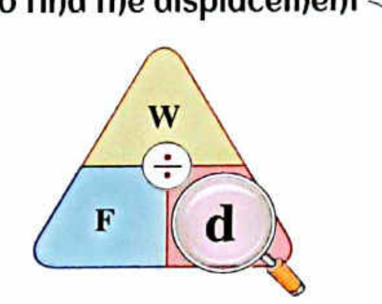
To find the work



To find the force



To find the displacement



Problem

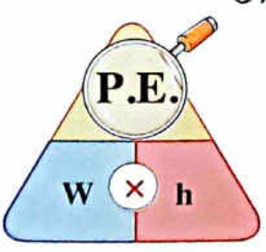
If a force of 100 newtons acted on a body to move it a distance 3 metres in the direction of the force. Calculate the work done.

Solution

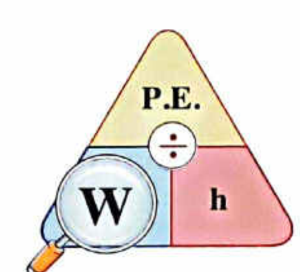
W = F × d   W = 100 × 3 = 300 joule

2. Weight (w) = Mass (m) × Acceleration due to gravity (g)
«Newton» «kg» «m/sec^2»
Potential energy (P.E.) = Weight (w) × Height (h)
«Joule» «Newton» «metre»

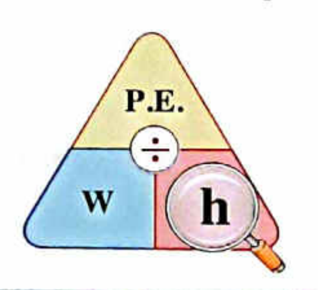
To find the potential energy



To find the weight



To find the height



Problems

1 ***Calculate the potential energy of a body, whose mass is 2.5 kg. and it is found at a height of 5 m.*** ***"Acceleration due to gravity = 10 m/sec^2."***

Solution

Weight = Mass × Acceleration due to gravity = 2.5 × 10 = 25 N.
P.E. = Weight × Height = 25 × 5 = 125 joule

2 ***What is the weight of a body, whose potential energy is 88 joule and it is found at a height of 11 m. ?***

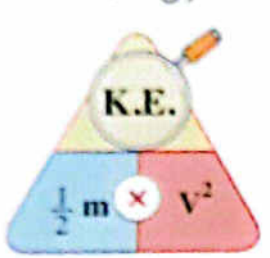
Solution

$$\text{Weight} = \frac{\text{Potential energy}}{\text{Height}} = \frac{88}{11} = 8 \text{ newton}$$

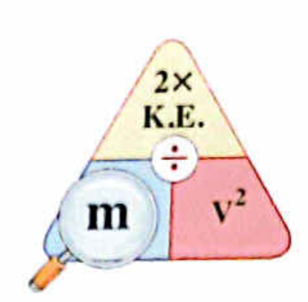
3. Kinetic energy (K.E.) $= \frac{1}{2} \times$ Mass (m) $\times$ (Speed)^2 (V)^2
«Joule» «kg» «(m/sec.)^2»

The measuring unit of speed is m/sec.

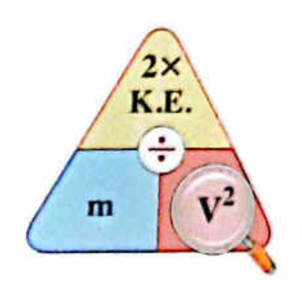
To find the kinetic energy



To find the mass



To find the speed



Problems

1 ***Calculate the kinetic energy of a body, whose mass is 2 kg. and moves with a speed of 4 m/sec.***

Solution

$$K.E. = \frac{1}{2} \times \text{Mass} \times (\text{Speed})^2 = \frac{1}{2} \times 2 \times (4)^2 = 16 \text{ joule}$$

2 ***Calculate the speed of a moving body, whose mass is 80 kg. and its kinetic energy is 4000 joule.***

Solution

$$K.E. = \frac{1}{2} \times \text{Mass} \times (\text{Speed})^2$$

$$4000 = \frac{1}{2} \times 80 \times (V)^2$$

$$4000 = 40 \times (V)^2$$

$$(V)^2 = \frac{4000}{40} = 100 \qquad \therefore V = 10 \text{ m/sec.}$$

4. When an object :

- **At maximum height :** • The mechanical energy = The potential energy.
  • The kinetic energy = zero.
- **On reaching the ground :** • The potential energy = zero.
  • The mechanical energy = The kinetic energy.
- **At the midpoint of its path :** • The potential energy = The kinetic energy $= \frac{1}{2}$ mechanical energy.
- **At any point :**

The work done = The mechanical energy of an object = Potential energy + Kinetic energy.

Problem

A ball was launched upwards vertically at a speed of 3 m/s. up to a height of 4 m. Calculate the work done on the ball if its weight = 5 newton, and its mass is 0.5 kg.

Solution

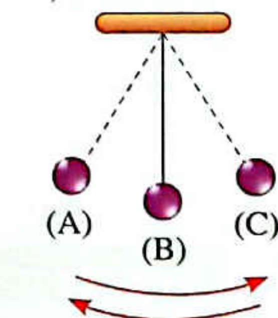
Potential energy = Weight × Height = 5 × 4 = 20 joule

Kinetic energy $= \frac{1}{2} \times$ Mass $\times$ (Speed)$^2 = \frac{1}{2} \times 0.5 \times (3)^2 = 2.25$ joule

Work done = Mechanical energy = Potential energy + Kinetic energy

= 20 + 2.25 = 22.25 joule

5. • When the pendulum passes its rest position (B), its speed is maximum, so
   - Kinetic energy is the maximum value.
   - Potential energy is the minimum value.
   - When the ball reaches the maximum height (A & C), its speed is zero, so
   - Potential energy is the maximum.
   - Kinetic energy is zero.





Problems

1 ***Study the given figure which shows a train toy in its path, then answer the following :***

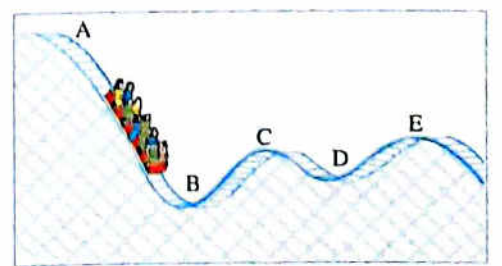
1. At which position ... ?

(a) the potential energy is maximum ?

(b) the kinetic energy is maximum ?

(c) the potential energy is minimum ?

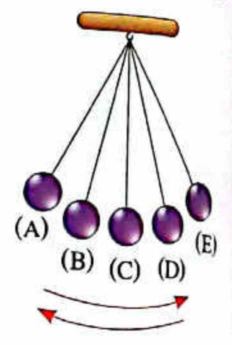
2. At which of the two positions (E) or (C), the potential energy is larger ? Why ?



Solution

1. (a) At position (A). (b) At position (B). (c) At position (B).
2. At position (E), because the height of (E) from the ground is larger than that of (C) and the potential energy increases by increasing the height.

2 ***Study the given figure, then answer :***



1. At which position(s), the kinetic energy is maximum ?
2. At which position(s), the potential energy is maximum ?
3. At which position(s), the kinetic energy = the potential energy ?

Solution

1. At position (C). 2. At positions (A) and (E).
3. At positions (B) and (D).

3 ***A pendulum, whose mass is 0.2 kg. and its mechanical energy is 1.2 joule, and its kinetic energy during its passing by the rest position is 0.9 joule. Calculate :***

1. The potential energy of the pendulum at the rest position.
2. The kinetic energy of the pendulum at the maximum point.
3. The speed of the pendulum at the moment of passing by the rest position.

Solution

1. Potential energy = Mechanical energy – Kinetic energy
$= 1.2 - 0.9 = 0.3$ joule
2. Kinetic energy = zero
3. Kinetic energy $= \frac{1}{2} \times \text{Mass} \times (\text{Speed})^2$

$$(\text{Speed})^2 = \frac{2 \times \text{K.E.}}{\text{Mass}} = \frac{2 \times 0.9}{0.2} = 9$$

$\therefore$ Speed = 3 m/sec.

4 Important tables :

1 Energy forms and resources :

Energy forms	Energy resources		
• Mechanical energy (Potential energy + Kinetic energy) :	• Stretched spring.	• Waterfalls.	
• Light energy :	• Electric lamp.	• Kerosene lamp.	• The Sun.
• Sound energy :	• Loudspeakers.	• Radio cassette.	
• Electric energy :	• Solar cell.	• Wind generator.	
• Chemical energy :	• Car battery.	• Food.	• Fuel.
• Heat energy :	• Oven. • Burning of wood.	• Heater.	
• Nuclear energy :	• The reactions in the nucleus of an atom (nuclear reactors).		

2 Energy transformations inside the car :

Car constituents (technological applications)	Energy transformations
• Car engine :	– The chemical energy stored in the fuel changes by burning into thermal (heat) energy. – Heat energy changes into mechanical energy (to move the car).
• Car dynamo :	– A part of mechanical energy (kinetic energy) changes into electric energy.
• Car lamps :	– A part of electric energy changes into light and heat energies.
• Car radio cassette :	– A part of electric energy changes into sound energy.
• Electric heater of car air conditioner :	– A part of electric energy changes into heat energy.

3 Energy transformations in some technological applications :

Technological applications	Energy changes	
	From	Into
• Solar cell : • Solar battery :	Solar energy	Electric energy
• Nuclear reactor :	Nuclear energy	
• Sewing machine : • Electric fan : • Washing machine :	Electric energy	Kinetic energy
• Electric heater :	Electric energy	Heat energy
• Electric bell :	Electric energy	Sound energy
• Electric lamp :	Electric energy	Light & heat energies
• A cellular phone : • Television :	Electric energy	Light & sound energies
• Solar heater : • Solar oven : • Solar furnace :	Solar energy	Heat energy

4 Some technological applications and their negative effects :

Technological applications	Negative effects
• **Cars :**	– Their exhausts cause chemical pollution of air.
• **Military explosions :**	– They leave harmful effects, diseases and cause death.
• **Chemical pesticides :**	– They cause chemical pollution of soil, air and water. – They cause cancer and food poisoning.
• **Nuclear weapons :**	– They cause the massive destruction.
• **The networks of wireless transmitters of cellular phones :**	– They cause electromagnetic pollution.
• **Loudspeakers and drilling machines :**	– They cause noise pollution.

5 Some technological applications which produce heat energy :

The device	The resource of energy depending on it	The kind of energy resource	The effect on the environment
• **Electric water heater :** • **Electric heater :** • **Electric stove :**	Electricity	Renewable	Non-polluting
• **Solar heater :** • **Solar oven :**	The Sun	Permanent	Non-polluting
• **Gas or petrol stove :**	Petroleum derivatives	Non-renewable	Polluting
• **Gas oven :**	Natural gas	Non-renewable	Polluting
• **Coal heater :**	Coal	Non-renewable	Polluting

5 Give reasons for :

1. **The fuel inside the car is similar to the food inside the body of the living organism.**
   Because burning each of them produces an energy which makes the car moves (do work) and the living organism makes its vital processes (do work).
2. **Some countries try to use the wind energy and solar energy as resources of energy.**
   Because they are cheap and clean resources of energy as they do not pollute the environment.
3. **The person who pushes a car forward consumes energy.**
   Because he does work on the car.

4. **The weight of an object is different from its mass.**
Because object's weight = object's mass × acceleration due to gravity.
5. **Potential energy of an object increases by increasing its weight.**
Because the potential energy is directly proportional to the weight of the object, where potential energy = weight × height.
6. **No change in the potential energy when the object moves horizontally.**
Because its height doesn't change as the potential energy is directly proportional to the height of the object from the ground, where potential energy = weight × height.
7. **When an object falls from up to down, its potential energy decreases gradually.**
Because its height decreases gradually and the potential energy is directly proportional to the height of the object from the ground.
8. **The potential energy of a falling object at the moment of its reaching the Earth's surface equals zero.**
Because the height of the object from the Earth's surface at this moment equals zero and the potential energy of an object = weight × height.
9. **When the moving object stops, its kinetic energy becomes zero.**
Because the speed of the object becomes zero and the kinetic energy of an object equals [$\frac{1}{2}$ × mass × (speed)^2].
10. **The work done to stop a moving car increases by increasing the speed of the car.**
Because by increasing the speed of the car, its kinetic energy increases, thus the work done to stop it increases.
11. **The kinetic energy of an object increases when it falls, although its mass is constant.**
Due to increasing its speed as the kinetic energy is directly proportional to the square of the speed of the moving object.
12. **The kinetic energy of a moving object increases by the increase of its mass.**
Because the kinetic energy of a moving object is directly proportional to its mass.
13. **At the maximum height of a projectile, its mechanical energy is equal to its potential energy only.**
Because the mechanical energy of an object is the sum of potential and kinetic energies of the object and the kinetic energy at the maximum height equals zero, so the mechanical energy at the maximum height equals the potential energy only.
14. **Although the decrease in the value of potential energy of an object during its falling, its mechanical energy still constant.**
Because the decrease occurs in the potential energy of an object during falling equals the increase in its kinetic energy.
15. **The value of the kinetic energy of an object couldn't be more than its mechanical energy.**
Because the mechanical energy of an object is the sum of potential and kinetic energies of the object.
16. **In the simple pendulum, the kinetic energy of the vibrating body is maximum when it passes its rest position during its movement.**
Because at that position, the speed of the pendulum is maximum.

17. When the pendulum reaches the maximum point, the kinetic energy equals zero.
Because at the maximum point, the speed of the pendulum equals zero and the kinetic energy = $\frac{1}{2}$ × Mass × (Speed)^2.

18. When the pendulum reaches the maximum point, the potential energy equals the mechanical energy.
Because at the maximum point, the kinetic energy equals zero and the mechanical energy equals the sum of potential and kinetic energies.

19. During motion, the moving object keeps its mechanical energy constant.
Because the potential and kinetic energies of the object are interchanged during its movement, where the decrease in the potential energy equals the increase in the kinetic energy at any moment and vice versa.

20. The motion of the children's swing is like that of the pendulum.
Because in both of them, the potential energy and kinetic energy are interchanged without ending and the sum of such energies (mechanical energy) at any moment is constant.

21. When two different metals connected with a compass are dipped in a lemon, the needle of the compass deflects.
Due to the flow of an electric current.

22. An electric current is generated when copper wire and zinc rod are dipped inside a lemon after connecting them with an electric lamp.
Because the chemical energy stored in the lemon is converted into electric energy.

23. Immersing two copper plates in diluted sulphuric acid is not considered a simple electric cell.
Because the simple electric cell must have two different metal plates immersed in diluted sulphuric acid.

24. You should take care of touching the electric lamp in your house on lightening.
Because it is very hot as electric energy is changed into heat and light energies.

25. Using batteries in the electric circuits.
Because the battery stores chemical energy inside it which is converted into electric energy in the electric circuit.

26. Presence of electric generator inside the car.
To convert a part of mechanical (kinetic) energy of the car into electric energy which is converted into :
– Light energy (in car lamps).
– Sound energy (in car radio cassette).
– Heat energy (in electric heater of car air conditioner).

27. Some technological applications have negative effects.
Because some of them cause environmental pollution as :
• Electromagnetic pollution. • Noise pollution.
• Chemical pollution of air, water and soil.
In addition to when man used them in : • Wars and killing. • Massive destruction.

28. Car exhausts are considered from the negative effects of technological applications.
Because they cause chemical pollution of air.

29. You must rationalize using chemical pesticides.
Because they cause chemical pollution of water, air and soil, and cause cancer and food poisoning.

30. **Ecologists do not appreciate all the technological applications which are used in energy transformations.**
Because some of these applications have negative effects on the environment.

31. **You feel warm when you rub your hands together in winter.**
Because the kinetic energy is converted into heat energy by friction.

32. **The temperature of the bike frame rises after using the brakes directly.**
Because the friction of the bike frame with the brakes converts the mechanical energy into heat energy.

33. **The temperature of objects increases by increasing their speed.**
Because the temperature of objects is directly proportional to their speed.

34. **The nail gets hot when you pull it out from a thick wooden piece.**
Because the friction of the nail with the wooden piece during taking it off converts the mechanical energy into heat energy.

35. **You feel hot when you touch a hot metallic spoon.**
Because heat is transferred from the hot object (spoon) to the cold object (body) by conduction.

36. **The temperature of a hot metallic piece decreases when it is placed in a cup of cold water.**
Due to transferring of heat from the hot metallic piece (higher in temperature) to the cold water (lower in temperature).

37. **Cooking pans are made up of aluminium and copper.**
Because they are good conductors of heat and they have high melting points.

38. **• The freezer is found at the top of the fridge.**
• Air conditioner is put at a high position in the room.
Because when air is cooled, its density increases, so it falls down to cool the food in the refrigerator (or to cool the room) and the hot air rises up to be cooled again and so on.

39. **The heater is placed on the ground.**
Because when air around the heater is heated, its density decreases so it rises up to warm the room, while the cold air falls down to be heated again and so on.

40. **The heat of the Sun doesn't reach the Earth by conduction or convection.**
Because there is a vast vacuum between the Sun and the Earth.

41. **The heat of the Sun is transferred to us by radiation.**
Because the transfer of heat by radiation doesn't need any material medium through which heat transfers.

42. **It is preferred to use the Sun and electricity as sources of heat energy than coal and petrol.**
Because the Sun and electricity don't pollute the environment, while coal and petrol pollute the environment.

43. **Importance of solar energy in our life.**
Because it is the main source of most energies on the Earth's surface.

44. Nuclear stations which produce electricity are preferred to those of petrol stations.
Because nuclear stations don't pollute the environment, while petrol stations pollute the environment.

45. The production of electricity from solar energy is preferred to that produced from burning of fuel.
Because the Sun is a permanent source of energy, which doesn't pollute the environment, while fuel is a non-renewable source of energy which pollutes the environment.

46. Solar energy is among preferable kinds of energy.
Because solar energy is a clean source of energy which doesn't pollute the environment and it is a permanent source of energy.

47. It is preferred using solar heater to any other heater such as gas heater or electric heater.
Because solar heater depends on the Sun which is a permanent and cheap resource of energy.

6 What happens when ... ?

1. **A person doesn't eat food for a long time.**
He will not get the energy that enables him to carry out various vital activities (to do work).
2. **Decreasing the force to half and increasing the displacement to double (concerning the work done).**
The work done doesn't change.
3. **Doubling the weight of an object and its height from the ground is constant (concerning its potential energy).**
Its potential energy is doubled.
4. **Doubling the speed of a moving object and its mass is constant (concerning its kinetic energy).**
Its kinetic energy increases four times.
5. **Falling an object from a high position (concerning its mass).**
Its mass doesn't change.
6. **Increasing the height of an object from the Earth's surface to double and decreasing its mass to half (concerning its potential energy).**
Its potential energy doesn't change.
7. **Doubling the mass of a moving object and its speed is constant (concerning its kinetic energy).**
Its kinetic energy is doubled.
8. **Increasing the speed of an object to double and its mass decreases to half (concerning its kinetic energy).**
Its kinetic energy is doubled.
9. **Lifting a ball upwards (concerning the work done on it).**
The work done on it is stored in the form of potential energy which increases by increasing the height from the ground.

10. Falling an object towards the Earth's surface (concerning its potential and kinetic energies).
The potential energy decreases gradually with the same value of increasing its kinetic energy.

11. You pull a simple pendulum away from its rest position to a higher position, then leave it.
The pendulum moves on both sides around its rest position, where its speed decreases as it goes away from its rest position and is maximum when it passes its rest position during its movement.

12. The simple pendulum passes its rest position (concerning kinetic and potential energies).
Its kinetic energy is maximum, while its potential energy is minimum.

13. The moving pendulum strikes the rest one.
The rest pendulum moves, while the moving pendulum stops.

14. The simple pendulum reaches the maximum height (concerning kinetic and potential energies).
Its kinetic energy equals zero, while its potential energy is maximum.

15. Dipping two different metals connected by a wire in an acidic solution.
An electric current flows through the wire.

16. Coil a wire connected with two metals of the simple electric cell around a compass.
The needle of the compass deflects in a certain direction as a result of passing an electric current in the wire.

17. Burning fuel inside the car engine.
The chemical energy stored in the fuel is changed by burning into heat energy which is changed into mechanical energy causing the operation of the car.

18. Overuse of chemical pesticides.
They cause chemical pollution of water, air and soil and hence cause cancer and food poisoning.

19. Construction of the networks of wireless transmitters of cellular phones near the buildings.
They cause the electromagnetic pollution.

20. Rubbing your hands together.
The mechanical energy changes into heat energy by friction.

21. There is friction between a bike tire and a rough surface.
The temperature of the tire rises.

22. Removing a nail strongly from a wooden piece.
The temperature of the nail rises.

23. Increasing the speed of a group of objects and their friction with each other.
Their kinetic energy increases, therefore their temperature rises.

24. Two objects touch each other, one of them is hot and the other is cold.
The heat transfers from the hot object to the cold object until their temperatures become equal.

25. A metallic piece of temperature 70°C touches another piece of temperature 30°C.
The heat transfers from the metallic piece of higher temperature (70°C) to that of lower temperature (30°C) until their temperatures become equal.

26. Two objects have the same temperature touch each other.
The heat doesn't transfer between them.

27. You touch the outer end of a metallic spoon placed inside a glass of hot water.
The heat transfers from the spoon to the hand by conduction.

28. You fix the freezer in the lower part of refrigerator.
The lower part of the refrigerator only is cooled, because the cold air (of high density) doesn't rise up.

29. Putting the electric heater at a high place of the room.
The upper part only of air is heated inside the room.

30. You use a petrol stove (related to the environment).
It pollutes the environment.

7 Comparisons :

1 Potential energy and kinetic energy :

Points of comparison	Potential energy	Kinetic energy
• Definition :	It is the energy stored in the object due to the work done on it.	It is the work done during the motion of an object.
• Factors affecting it :	• Weight of the object. • Height of the object from the ground.	• Mass of the object. • Speed of the object.
• Law used :	Potential energy = Weight × Height.	Kinetic energy = $\frac{1}{2}$ × Mass × (Speed)^2.

2 Ways of heat transfer :

Points of comparison	Heat transfers by conduction	Heat transfers by convection	Heat transfers by radiation
• Definition :	It is the transfer of heat through some solid objects from the part with higher temperature to that with lower temperature.	It is the transfer of heat in gases and liquids, where hot molecules which have less density rise upwards, while colder molecules which have more density, fall down.	It is the transfer of heat from hot object to another without any need for a material medium through which heat transfers.
• The medium transfers through :	Some solid objects.	Liquids and gases.	No need for a material medium.
• Application :	Cooking pans are made up of copper and aluminium.	The freezer of the fridge is found at the top of the fridge.	Heat of the Sun transfers through space by radiation.

8 Activities :

Activity (1) To show the effect of object's weight on its potential energy :

Steps :

1. Lift a ball from the ground up to a table level.
2. Repeat using two and three balls, then four balls.

Observation :

The work (effort) done to lift balls up increases by increasing the number of lifted balls (the weight).

Conclusion :

The potential energy stored in an object increases by increasing its weight.
(i.e : The potential energy of an object is directly proportional to its weight.)

Activity (2) To show the effect of the height of an object from the ground on its potential energy :

Steps :

1. Bring a basin filled with sand and a somewhat heavy sphere.
2. Raise the sphere a half metre high and let it fall in the basin.
3. Repeat the previous step several times by increasing the height of the sphere and returning the sand graded every time.

Observation :

By increasing the height of the sphere upwards, the work done increases, therefore the print that the sphere makes in the sand increases by increasing its height from the ground.

Conclusion :

The potential energy increases by increasing the height at which the object reaches.
(i.e : The potential energy of an object is directly proportional to its height from the ground.)

Activity 3 To prove the conservation of mechanical energy of a body during its movement :



Step :

Pull with your hand gently a simple pendulum, then leave it.

Rest position (B)

Observations :

1. The simple pendulum moves on both sides around its rest position (B).
2. The speed of the vibrating pendulum decreases as it goes away from its rest position.
3. The speed of the vibrating pendulum is maximum when it passes its rest position during its movement.



Conclusion :

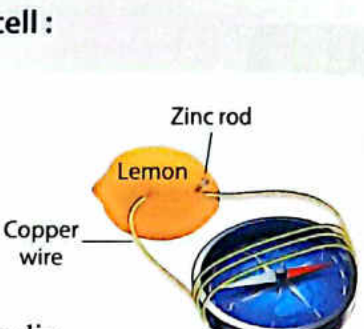
The object keeps its mechanical energy which alternates between potential energy and kinetic energy.

Activity  To make a model of a simple electric cell :



Tools :

- A large lemon.
- A copper wire.
- A small compass.
- A zinc rod.





Steps :

1. Press the lemon to soften it and to increase its juice, then dip the zinc rod in it.
2. Make the two terminals (ends) of the copper wire uncovered, then coil the wire around the compass several times.
3. Dip one of the uncovered terminals of the wire into the lemon and tie the other terminal around the zinc rod.



Observation :

The needle of the compass deflects.

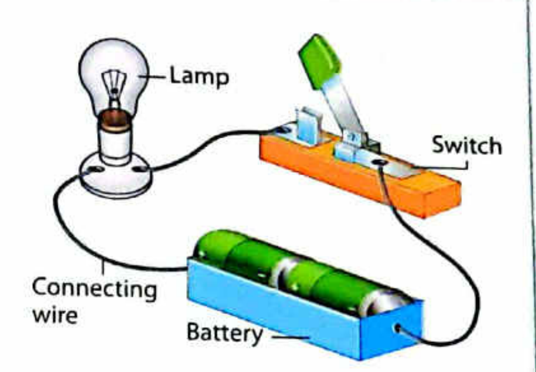
Conclusions :

- The simple electric cell consists of two different metals dipped in an acidic solution.
- In the simple electric cell, the chemical energy is changed into electric energy.

Activity 5 To show the changes of energy in the electric lamp :

Tools :

- A battery (dry electric cell).
- An electric lamp.
- Connecting wires.
- A switch.



Steps :

1. Connect the electric circuit (as shown in the figure).
2. Close the switch of the circuit for one minute, then open it again.
3. Touch the glass of the lamp with your hand after asking your teacher.

Observation :

The lamp lights and becomes hot on closing the switch.

Conclusion :

In the electric lamp, the electric energy is changed into light energy and heat energy.

Activity 6 To show that the kinetic energy changes into heat energy :

Steps :

1. Put a group of metallic spheres in a plastic jar and record their temperature first by using a thermometer.
2. Close the jar tightly, then shake it rapidly from 20 to 30 times then determine the temperature at the end.

Observation :

Increasing the temperature of the spheres gradually after shaking.

Conclusions :

- Kinetic energy changes into heat energy, because spheres movement and their friction with each other rise the temperature.
- The temperature is directly proportional to the speed of objects and their kinetic energy.

Activity 7 To show how heat energy is transferred :

Tools :

- A plastic cup containing tap water.
- A thermometer.
- A metal piece (as a nut fastener) tied by a thread.
- A beaker containing boiling water.

Steps :	Figures :	Expected temperature :
1. Record the temperature of the tap water by using the thermometer.	Thermometer; A cup containing tap water	The recorded temperature is 20°C.
2. Submerge the nut fastener in the boiling water by a thread for several minutes until both of them become equal in temperature then record this temperature.	Nut fastener; Boiling water	The recorded temperature is 100°C.
3. Transfer the nut fastener from the boiling water to the tap water, then record their temperature together.		The recorded temperature is 25°C.

Observation :

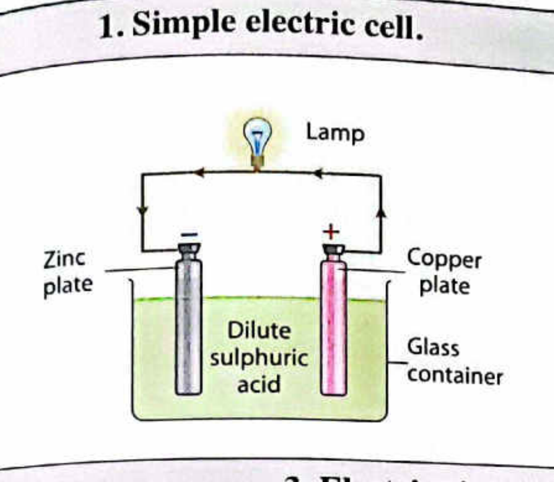
The temperature of water on putting the hot nut fastener in it is more than the temperature of tap water and less than the temperature of boiling water.

Conclusion :

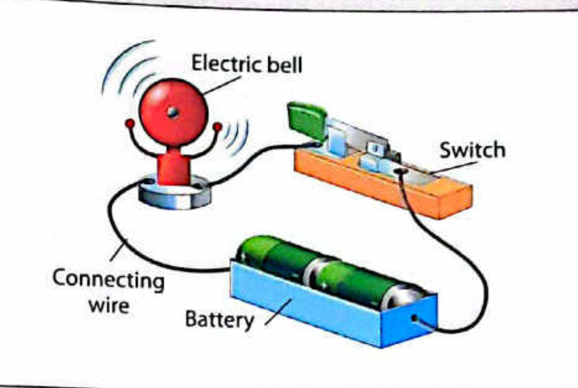
When touching two objects with different temperature, the heat is transferred from an object of higher temperature to another of lower temperature, then it stops when they are equal in temperature.

9 Important drawings :

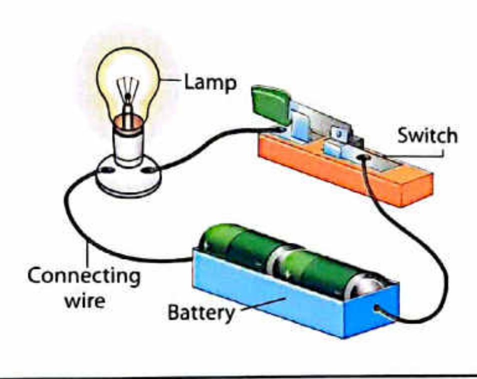
1. Simple electric cell.



2. Electric circuit to attend a blind person.



3. Electric circuit to attend a deaf person.



Final Revision on Unit 3

1 Definitions (or scientific terms) :

1. Micro-organisms :	They are living organisms that can't be seen by the naked eye, but they spread everywhere around us (in air, water and soil).
2. Taxonomy :	It is a branch of biology that searches for the similarities and the differences among living organisms and it places the similar ones in groups according to a certain system in order to ease their study.
3. Algae :	They are the plants that can't be distinguished into roots, stems and leaves.
4. Ferns :	They are small terrestrial plants that reproduce by formation of spores.
5. Gymnosperms :	They are non-flowering plants that their seeds are formed inside cones and not inside a pericarp (fruit envelope).
6. Angiosperms :	They are flowering plants that their seeds are formed inside a pericarp.
7. Arthropods :	They are invertebrate animals that are characterized by the presence of jointed legs.
8. Species :	- It is a group of more similar living organisms in shape that can reproduce to give birth of new fertile individuals which are able to reproduce and keeping the existence of the species. - It is the basic classification unit for living organisms.
9. Adaptation :	It is a modification of a living organism's behaviour or its body structure, or even the biological functions of its organs to become more adapted to the environmental conditions where it lives in.
10. Structural (anatomical) adaptation :	It is a modification in the structure of one of body organs of a living organism to cope with the environmental conditions.
11. Functional adaptation :	It is a modification in some tissues and organs of the body of a living organism to become able to do specific functions.
12. Behavioural adaptation :	It is a modification in the behaviour of a living organism at specific times of the day or year.
13. Predacious (insectivorous) plants :	They are self-feeding (autotrophic) green plants that their roots can't absorb the nitrogenous substances from the soil needed to make proteins.
14. Hibernation :	It is the behaviour through which some animals dormant and stop most of their vital activities to avoid the low temperature in winter.
15. Aestivation :	It is the behaviour through which some animals dormant and stop most of their vital activities to avoid the extreme rise in temperature in summer and shortage of water and rains.

16. Birds migration :	It is the inherited behaviour in some species of birds, where they migrate from cold and polar regions to more lighted and warmer regions for reproduction.
17. Camouflage :	It is the ability of some living organisms to be hidden from their enemies or to capture the preys in the predatory species.

2 Important tables :

1 Diversity and classification of living organisms :

Living organisms	Examples
1. Big animals :	Elephant – Rhinoceros – Camel.
2. Small animals :	Rabbit – Rat – Lizard.
3. Animals live in water :	Fishes – Crocodiles – Hippopotami.
4. Animals live on land :	Horse – Lion – Dog.
5. Huge trees :	Camphor – Palm tree.
6. Short weeds :	Clover – Gargeer.
7. Plants carry large-sized leaves :	Banana.
8. Plants carry small-sized leaves :	Molukhiyah.
9. Micro-organisms (unicellular organisms) :	Amoeba – Euglena – Paramecium.
10. Plants can't be distinguished into roots, stems and leaves :	Algae (green, red and brown algae).
11. Plants are distinguished into roots, stems and leaves :	Maize (corn) – Wheat – Palm tree – Camphor – Bean.
12. Plants reproduce by formation of spores :	Vougheir – Adiantum.
13. Plants reproduce by formation of seeds :	• **Gymnosperms :** Pine – Cycas. • **Angiosperms :** – *Monocotyledon plants :* Maize – Wheat – Palm tree. – *Dicotyledon plants :* Bean – Pea.
14. Animals with soft bodies :	Jellyfish – Octopus – Earthworm.

15. Animals with supported bodies :	• **External support :** Mussel – Desert snail. • **Internal support :** Vertebrates (birds – cow and fish).
16. Insects :	Locusts – Bees – Flies – Cockroaches – Ants – Mosquitoes.
17. Arachnids :	Spider – Scorpion.
18. Myriapods :	Scolopendra – Julius.
19. Edentates (Teethless mammals) :	Sloth – Armadillo.
20. Mammals having teeth :	• **Animals have front teeth extending outwards :** Hedgehog. • **Animals have pointed canines and molars with sharp projections :** Lion – Tiger – Fox – Dog. • **Animals have sharp incisors :** – *Rodents :* Rat – Jerboa – Squirrel. – *Lagomorphs :* Rabbit.

2 Examples for some living organisms :

Living organisms	Examples
1. Insectivorous plants :	Dieonea – Drosera – Halophila.
2. Animals undergo hibernation :	Some reptiles – Some insects – Frogs – Toads.
3. Animals undergo aestivation :	Jerboa – Desert snail – Some insects.
4. Animals migrate :	Quail bird.
5. Animals adapted by camouflage :	Leaf insect – Stick insect – Chameleon.

3 Function (or importance) :

1. The thick flat pad at the end of camel limbs :	To enable the camel wandering through the hot desert sand.
2. Strong solid hoof at the end of horse limbs :	To enable the horse to run on the rocky soil.
3. Paddles in dolphins :	To perform the function of swimming and diving in water.
4. Wings in bats :	To perform the function of flying.
5. Elongated front limbs in monkey :	To enable it to climb trees and catch things.
6. Strong and sharp crooked beaks in hawks :	To tear the prey's flesh.

7. Sharp claws in vultures :	To control pouncing the prey.
8. Long thin beaks in heron :	To pick up worms and snails.
9. Long thin legs in hoopoe :	To suit walking in the existence of water.
10. Wide indented beaks in ducks :	To filter their food from water.
11. Palm legs in geese :	To help them in swimming.

4 Give reasons for :

1. **Living organisms must be classified.**
   Due to the enormous diversity in living organisms species, so they must be classified into groups to facilitate their study.
2. **We can distinguish between banana plant and molukhiyah plant.**
   Because banana plant carries large-sized leaves, while molukhiyah plant carries small-sized leaves.
3. **Amoeba is from micro-organisms.**
   Because it is from unicellular organisms that can be seen only by the microscope.
4. **Adiantum plant is classified as a fern plant.**
   Because it is considered as small terrestrial plant which reproduces by formation of spores.
5. **Cycas is a gymnosperm plant.**
   Because it reproduces by formation of seeds which are formed inside cones and not inside a pericarp (fruit envelope).
6. **Pea and wheat plants are angiosperm plants.**
   Because their seeds are formed inside a pericarp.
7. **The bodies of jellyfish and octopus are soft.**
   Because their bodies don't have support.
8. **Cockroach and locust are classified as insects.**
   Because they are arthropods that have three pairs of jointed legs.
9. **Spider and scorpion belong to arachnids.**
   Because they are arthropods that have four pairs of jointed legs.
10. **Scorpion (or spider) isn't considered from insects.**
    Because scorpion (or spider) has four pairs of jointed legs, while insects have three pairs of jointed legs.

11. Scolopendra and julius are classified as myriapods.

Because they are arthropods that have numerous number of jointed legs.

12. Sloth and armadillo are classified as edentates animals.

Because they have no teeth.

13. Hedgehog has front teeth extending outwards.

To capture insects.

14. Rat (or squirrel) is from rodents, while rabbit is from lagomorphs.

Because rat (or squirrel) has one pair of incisors in each jaw, but rabbit has two pairs of incisors in the upper jaw and one pair in the lower jaw.

15. The individuals of the same species differ in some external characteristics.

Because each of them has its specific shape.

16. It is impossible for cat to mate rabbit.

Because cats and rabbits are from two different species.

17. The diversity and adaptation of living organisms.

To cope with the environmental changes.

18. Camel limbs end in a thick flat pad.

To enable the camel wandering through the hot desert sand.

19. Horse limbs end in a strong solid hoof.

To help the horse go through the rocky soil.

20. Secreting poison in snakes is considered a functional adaptation, while the shape of horse limb is considered a structural (anatomical) adaptation.

Because functional adaptation represents a modification in a specific organ to be able to do a specific function (secreting poison), while anatomical adaptation represents a modification in the structure of one of body organs to cope with the environmental conditions (horse limb).

21. Secreting sweat in humans in case of high temperature is considered a functional adaptation.

Because it represents a modification in a specific organ to be able to do a specific function (secreting sweat).

22. Birds migration is a behavioural adaptation.

Because it represents a modification in the behaviour of birds at a certain time in order to survive.

23. Occurrence of adaptation in animal world.

To get food, move in different environments and escape from their enemies in dangerous situations.

24. • Mammals limbs are adapted in many forms.

• Although limbs of mammals are composed of the same bones, some modifications took place in them.

To match with the way of movement, the animal life style and the dominant environmental conditions.

25. The front limbs of whales and sea lions are modified into paddles.

To perform the function of swimming and diving in water.

26. Bat front limbs are modified into wings.

To perform the function of flying.

27. In monkeys, bones of the front limbs and fingers are elongated.

To perform the function of climbing trees and catching things.

28. The two front limbs in the dolphin are different from that of a bat although they are structured with similar bones.

Due to the modification of front limbs to suit the way of movement, where in dolphin they are modified into paddles to perform the function of swimming and diving, while in bat they are modified into wings to perform the function of flying.

29. Beaks and legs of birds are modified in many different ways.

To suit the way of movement, the type of food that the bird feeds on and the environmental conditions.

30. Predatory birds have strong and sharp crooked beaks.

To tear their prey's flesh.

31. • The fingers of predatory birds end in strong sharp claws.

• The legs of predatory birds have three anterior fingers and posterior one.

To control pouncing the prey.

32. Some birds have long and thin beaks and their long legs end in thin toes.

The beaks are long and thin to pick up worms and snails and their legs are long thin ending in thin toes to walk in the existence of water.

33. Ducks and geese have wide indented beaks and palm legs.

The beaks are wide indented to help them to filter the food from water and the palm legs to help them in swimming.

34. Insectivorous plants are autotrophic plants.

Because they can make their own food (carbohydrates) by photosynthesis process.

35. Some parts of leaves of insectivorous plants are modified.

To pounce and digest the insects, then absorb the nitrogenous substances that the plants need to make protein.

36. Some plants pounce insects.

To absorb the nitrogenous substances that their bodies need to make protein.

37. • Some animals undergo hibernation.

• Some reptiles hide in burrows, while frogs bury themselves in mud and stop feeding in winter.

To overcome the decrease in temperature.

38. • Some animals undergo aestivation.

• Jerboa becomes dormant and hides in humid burrows in summer.

To overcome extreme rise in temperature and shortage of water and rains.

39. Some species of birds migrate from their original habitats in winter.

To search for more lighted and warmer regions for reproduction.

40. Quail bird is a good example of adaptation to the environmental conditions.

Because in winter, quail bird migrates from cold and polar regions to more lighted and warmer regions for reproduction at the same time every year.

41. Leaf insect is hardly to be discovered by its enemies.

Because it looks like the plant leaf exactly in its colour and shape of wings.

42. It is hard to discover the stick insect.

Because it looks like the branches of plants as well.

43. Chameleon colours itself with the dominant colour in the environment.

To be hidden from its preys of insects to capture them and feed on them.

44. The camel is considered a desert ship.

Because it is considered one of the most adapted animals to live in desert environment.

5 What happens when ... ?

1. **Removing the front teeth of hedgehog.**

   It is unable to capture insects.

2. **Mating between two individuals from the same species of living organisms.**

   It produces new fertile individuals from the same species.

3. **Mating between a donkey and a horse.**
The produced offspring will be a sterile female called "mule".
4. **An exchange happens between the camel pad and the horse hoof.**
The feet of the camel sink into the sand and the horse cannot run on the rocky soil.
5. **The front limbs of whales are not modified into paddles.**
They become unable to swim and dive in water.
6. **The bones of front limbs and fingers of monkeys are not elongated.**
They become unable to climb trees and catch things.
7. **The front limbs of bats are not modified into wings.**
They become unable to fly.
8. **The beaks of predatory birds are weak.**
They become unable to tear the flesh of preys.
9. • **The fingers of predatory birds are not ended in claws.**
• **The four fingers of predatory birds lie at the same side.**
They become unable to control pouncing their preys.
10. **The beaks of ducks are narrow and not indented.**
They become unable to filter their food from water.
11. **The legs of geese are not palm.**
They become unable to swim.
12. **The beak of heron is not long and thin.**
It can't pick up worms and snails.
13. **The beaks of hoopoe and hawk are mutually exchanged.**
Hoopoe will feed on meat, while hawk will feed on worms and snails.
14. **Predatory plants cannot capture insects for a long period of time.**
They cannot make their needed proteins.
15. • **A desert animal does not make aestivation in summer.**
• **No aestivation occurs to jerboa.**
It will die, because it can't tolerate the extreme rise in temperature and shortage of water and rains.
16. **The aestivated animals don't store their food in the form of fats.**
They will die, because they don't obtain the enough food during aestivation.
17. **The polar bear cannot undergo hibernation.**
It will die because it can't tolerate the extreme cold.

18. Quail birds do not migrate from cold places in winter to warmer ones.

They are unable to make reproduction process and may die.

19. Chameleon can't make camouflage process.

Chameleon can't capture its preys for feeding and it may be seen by its enemies which prey it.

20. Stick insect or leaf insect settle on a white wall.

It is easily to be discovered by its enemies.

6 What are the results based on ... ?

1. **Increasing the well known species of living organisms.**

   Putting taxonomic plans of classification of living organisms.

2. **The variety of ways of motion in mammals.**

   Some adaptations took place in mammals limbs to suit the way of movement.

3. **The variety of food for birds.**

   Their beaks are modified into several shapes.

4. **Living of mammals in varied environments.**

   Their front limbs are modified to suit the ways of movement.

5. **Stick insect looks like the branches of plants.**

   It can hide from its enemies.

7 Comparisons :

1 Gymnosperms and angiosperms :

Points of comparison	Gymnosperms	Angiosperms
• Seeds :	Their seeds are formed inside cones.	Their seeds are formed inside fruit envelope (a pericarp).
• Examples :	Pine and cycas.	Maize and bean.

2 Insects , arachnids and myriapods :

Points of comparison	Insects	Arachnids	Myriapods
• No. of jointed legs :	3 pairs.	4 pairs.	Large number.
• Examples :	Locusts and bees.	Spiders and scorpions.	Julius and scolopendra.

3 Rodents and lagomorphs :

Points of comparison	Rodents	Lagomorphs
• No. of incisors in each jaw :	One pair in each jaw.	Two pairs in the upper jaw and one pair in the lower jaw.
• Examples :	Rat and squirrel.	Rabbit.

4 Camel limbs and horse limbs :

Camel limbs	Horse limbs
Camel pad ends in a thick flat one to enable the camel wandering through the hot desert sand.	Horse hoof ends in a strong solid end to help the horse go through the rocky soil.

5 Types of adaptation :

Points of comparison	Structural (anatomical) adaptation	Functional adaptation	Behavioural adaptation
• Definition :	It is a modification in the structure of one of body organs of a living organism to cope with the environmental conditions.	It is a modification in some tissues and organs of the body of a living organism to become able to do specific functions.	It is a modification in the behaviour of a living organism at specific times of the day or year.
• Examples :	- Structure of camel pad. - Structure of horse hoof.	- Secreting sweat on rising temperature as in human body. - Secreting poison as in some snakes.	- Birds migration. - Activity of birds during daylight and bats at night.

6 Leaf insect , stick insect and chameleon :

Points of comparison	Leaf insect	Stick insect	Chameleon
• Features of adaptation :	It looks like the leaf of the plant.	It looks like the branches of plants.	It colours itself with the dominant colour of the environment.
• The reason of adaptation :	To be hardly discovered by its enemies.	To be hardly discovered by its enemies.	To be hidden from its preys of insects.

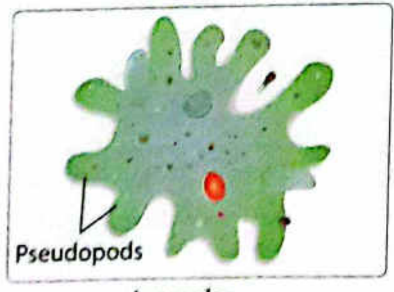
7 Birds that feed on meat, birds that feed on worms and snails, and birds that feed on mosses and fishes :

Points of comparison	Birds that feed on meat (predatory birds)	Birds that feed on worms and snails	Birds that feed on mosses and fishes (water birds)
• Beaks :	They are strong and sharp crooked to tear the prey's flesh.	They are long thin to pick up worms and snails.	They are wide indented in the two sides to help them filter the food from water.
• Legs :	They have four bendable fingers ending in strong and sharp claws, three anterior (front) fingers and one posterior (back) to control pouncing the prey.	They are long thin ending in thin fingers to walk in the existence of water.	They are palm to help them in swimming.
• Examples :	Hawks and vultures.	Heron and hoopoe.	Ducks and geese.

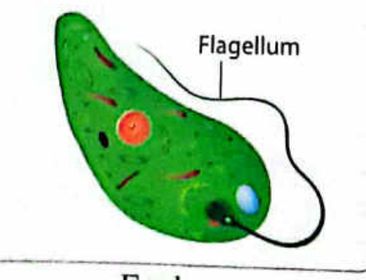
8 Hibernation and aestivation :

Points of comparison	Hibernation	Aestivation
• Time :	In winter.	In summer.
• Features of adaptation :	- Some animals hide in burrows as some reptiles and some insects. - Some animals bury themselves in mud, stop feeding and their activities decrease as frogs and toads.	Animals become dormant and hide in humid burrows as jerboa, desert snail and some insects.
• The reason of adaptation :	To overcome the decrease in temperature.	To overcome the extreme rise in temperature and the shortage of water and rains.

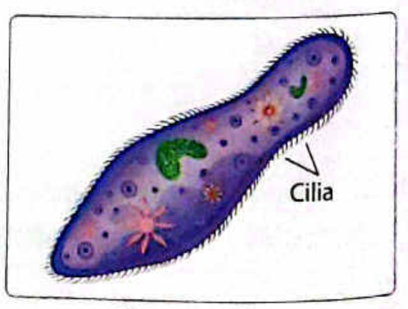
8 Important drawings :



Amoeba



Euglena

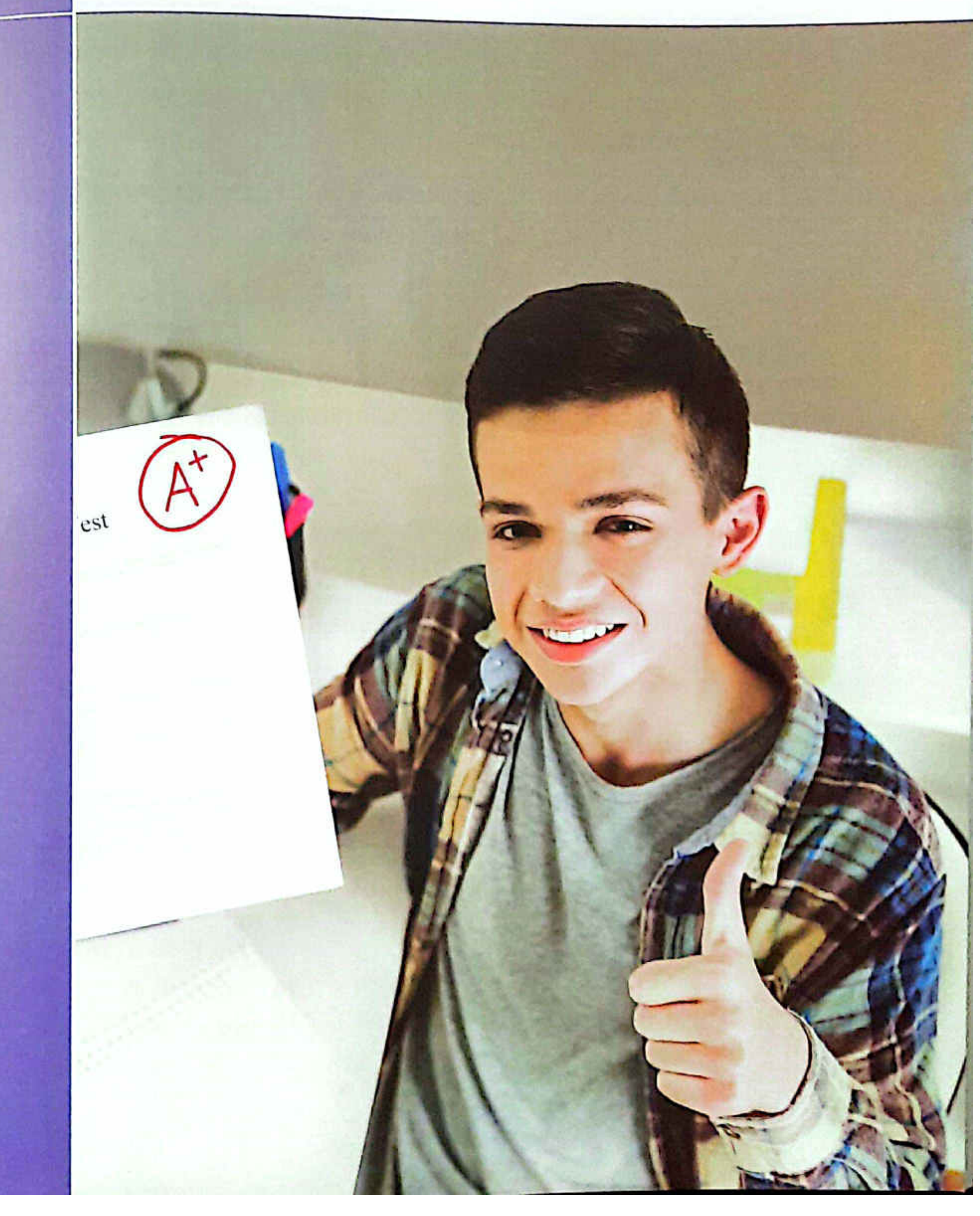


Paramecium

PART 3

Final Examinations

- Final Examinations of Some Governorates 2022.



1 Cairo Governorate

St. Joseph School

Answer the following questions :

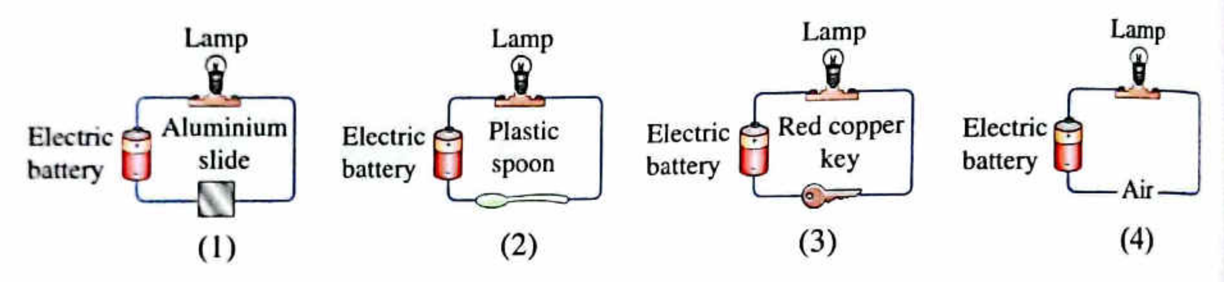
Question 1

A Give reasons for :

1. Iron rods not copper rods are used in building concrete houses.
2. The symbol of sodium is (Na) not (So) as it is expected.
3. When the ball of the pendulum reaches the maximum height, the kinetic energy equals zero.
4. Living organisms must be classified.

B Complete :

1. The second energy level "L" is saturated with .... electrons.
2. In the following figure : The lamp is illuminated in .... , ... cases only.



3. Oven is a source of .... energy.
4. .... is a modification in the behaviour of a living organism at specific time of the day or year.

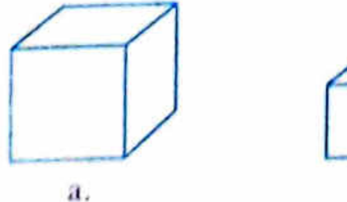
C What happens when ... ?

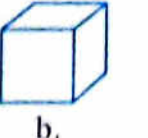
1. Rubbing your hands together.
2. Opening of a perfume bottle in a closed room.

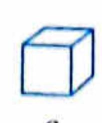
Question 2

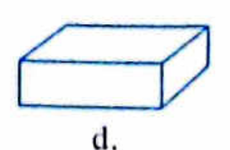
A Choose the correct answer :

1. The following cubes have he same mass. Which one has the highest density ? ....


a.


b.


c.


d.

2. In the following figure :
At which point the potential energy of the ball = zero ? ....

A
B
20 m.
C
Earth's surface

a. A
b. B
c. C
d. A & C

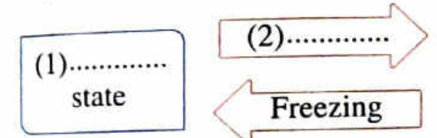
3. Silver is symbolized by ....
a. Hg
b. Ag
c. Cu
d. Au

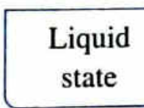
4. In the solar cells, the solar energy changes into .... energy.
a. kinetic
b. light
c. electric
d. sound

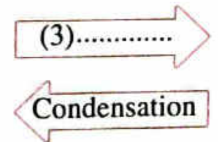
B Give an example of each of the following :

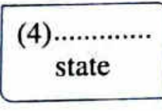
1. An animal of big size.
2. A plant carries small-sized leaves.

C Complete the following diagram :









Question 3

A Choose the odd word or symbol out, then write the scientific term of the other :

1. $_{2}He$ – $_{3}Li$ – $_{12}Mg$ – $_{19}K$.
2. Jellyfish – Octopus – Earthworm – Bird.
3. Acidic solutions – Sugary solutions – Salt solutions – Alkaline solutions.
4. Ice – Wood – A piece of Iron – Petroleum.

B Show by drawing the electronic configuration for each of the following atoms :

1. $_{10}Ne$
2. $_{17}Cl$
3. $_{20}Ca$
4. $_{1}H$

C What is meant by ... ?

1. The density of water is $1 gm/cm^3$.
2. The boiling point of water = 100°C.
3. The kinetic energy of an object = 40 joule.

Question 4

A Write the scientific term :

1. Anything that has a mass and a volume.
2. It is the ability to do work or to make a change.
3. They are living organisms that can't be seen by the naked eye, but they spread everywhere around us.

4. It is the smallest part of matter which can exist freely, and it has the properties of matter.
5. The sum of the potential and kinetic energies of an object.

B **Write the symbol of the following elements :**

1. a. Nitrogen. b. Argon. c. Iron.
2. **If the nucleus of an oxygen atom contains 8 protons and 8 neutrons, find the atomic number and the mass number of oxygen and how the symbol of oxygen element is written.**

C **Calculate :**

The density of iron cube, its mass is 78 gm. and its volume is 10 cm^3.

2 Cairo Governorate

Leaders Language Schools

Answer the following questions :

Question 1

A **Complete the following statements :**

1. An alloy of .... is used in making jewels, while an alloy of .... is used in making heating coils.
2. .... and .... plants reproduce by spores.
3. The liquid state of matter has .... shape and .... volume.
4. The mass number is the sum of .... number and .... number.

B **Put (✓) or (✗), and correct the wrong ones :**

1. Heat is transferred in solids by convection and radiation. ( )
2. The positive pole in the simple electric cell is copper. ( )
3. Two iron pieces with equal masses will have different volumes. ( )
4. Ammonia molecule consists of 3 atoms of 2 different elements. ( )

C **Problem :**

An object moves with speed 30 m/s, calculate its kinetic energy knowing that its mass is 500 gm.

Question 2

A **Choose the correct answer :**

1. All the following solutions conduct electricity except .... solution.
   a. salty b. acidic c. alkaline d. sugary
2. In the car engine, the chemical energy changes into .... energy.
   a. heat b. light c. mechanical d. electric

3. Heat is transferred through space by ....

a. convection. b. conduction.

c. radiation. d. conduction and convection.

4. Frogs hide themselves is mud during winter, it is called ....

a. aestivation. b. hibernation. c. camouflage. d. migration.

B Write the scientific term :

1. The plants which feed on insects.
2. A group of animals that have 1 pair of incisors in each jaw.
3. A group of gases their molecules are monoatomic molecules.
4. The change of matter from liquid state to gaseous state by heating.

C Compare between :

Electrons and protons. (concerning : their charge – their position in the atom).

Question 3

A Give reasons for :

1. The atom is electrically neutral.
2. When you leave the perfume bottle opened, you smell it all over the room.
3. Wind energy is preferable than fuel energy.
4. In monkeys, bones of the front limbs and fingers are elongated.

B Cross the odd word out :

1. Conduction – Convection – Friction – Radiation.
2. Electric fan – Electric heater – Electric bell – Petrol stove.
3. Wax – Aluminium – Butter – Ice.
4. Sodium – Ammonia – Water – Hydrogen chloride.

C What is the function of ... ?

1. The long beak in heron.
2. The palm legs in the geese.

Question 4

A What happens when ... ?

1. Using water in extinguishing of petrol fires.
2. An electron gains a quantum of energy.
3. The chameleon can't change its color.
4. The ants have 4 pairs of jointed legs.

B Give one example of each of the following :

1. Huge tree.
2. Big size animal.
3. Gymnosperm plant.
4. Device uses solar energy.

C Draw the electronic configuration and show the type of :

1. $_{19}K$
2. $_{10}Ne$

3 Cairo Governorate — Mokattam Language International School

Answer the following questions :

Question 1

A Complete the following statements :

1. The number of incisors pairs in the upper jaw of jerboa is .... , while in the upper jaw of rabbit is ....
2. Mechanical energy of an object = ... energy + ... energy.
3. In the dynamo .... energy changes into .... energy.
4. Potential energy depends on .... and .... of the object.

B Give an example of each of the following :

1. An animal with internal body support.
2. A good conductor of heat and electricity.
3. A liquid element consists of one atom.

C What is meant by atomic number ... ?

Question 2

A Write the scientific term of each of the following :

1. Positive charges that are found in the nucleus of the atom.
2. Energy stored in the object due to the work done on it.
3. The ability of some living organisms to hide from their enemies.
4. A method of transferring heat through solids.
5. The temperature at which the substance changes from liquid to gaseous state.
6. The branch of biology that searches for similarities and differences among living organisms.

B What happens when ... ?

1. Rubbing your hands together.
2. Adding a drop of ink in water.
3. Wet iron nail is left in the air.

C When a piece of iron of mass 78 gm is put in a graduated cylinder containing 100 cm^3 of water, the reading of the cylinder becomes 110 cm^3. Calculate the density of iron.

Question 3

A Put (✓) or (✗) and correct the wrong ones :

1. Mass number is the number of neutrons. ( )
2. Heat is transferred through gases by convection only. ( )
3. Bean plant is considered from dicotyledon plants. ( )
4. The third energy level is saturated with 18 electrons. ( )
5. Flies have six legs. ( )
6. Sodium and potassium are inactive metals ( )

B Write the electronic configuration of the following elements :

1. $_{18}Ar$ 2. $_{7}N$ 3. $_{17}Cl$

C Give reasons for :

1. The heat of the Sun is transferred to the Earth by radiation.
2. The front teeth of hedgehog are extending outwards.

Question 4

A Choose the correct answer :

1. The smell property is a distinguishing factor between ....
   a. wood and plastic. b. silver and gold.
   c. vinegar and perfume. d. iron and copper.
2. .... is from teethless mammals.
   a. Armadillo b. Rabbit c. Rat d. Lion
3. Balloons of festivals are filled with .... gas.
   a. oxygen b. nitrogen c. carbon dioxide d. helium
4. From the examples of living organisms that undergo aestivation is ....
   a. desert snail. b. heron. c. hawk. d. quail.
5. In the simple electric cell, ... energy is converted into electric energy.
   a. mechanical b. chemical c. sound d. light
6. .... is a renewable source of energy.
   a. Coal b. Petrol c. Wind d. Natural gas
7. An object of mass 4 kg. is moving at speed of 3 m/sec., its kinetic energy = ...
   a. 16 joule. b. 64 joule. c. 32 joule. d. 18 joule.
8. Birds migration represents .... adaptation.
   a. functional b. structural c. behavioural d. anatomical

B **Mention the symbols of the following elements :**

1. Oxygen. 2. Copper. 3. Iron. 4. Hydrogen.

C **Compare between :**

1. Insects and arachnids (according to : the number of legs).
2. Solids and gases (according to the intermolecular forces).

4 Cairo Governorate — Al-Ola Language Schools

Answer the following questions :

Question 1

A **Choose the correct answer :**

1. The density of substance is a .... property.
   a. chemical b. physical c. biological d. magnetic
2. On adding 70 cm^3 of water to 30 cm^3 of alcohol, the volume of the mixture becomes .... cm^3.
   a. 60 b. 97 c. 100 d. 102
3. Chemical energy can be stored in ....
   a. car batteries. b. stretched spring.
   c. raising a load upwards. d. car lamp.
4. Pea plant belongs to .... plants.
   a. fern b. dicotyledon c. monocotyledon d. gymnosperm

B **Choose the odd word out, then write the scientific term of the others :**

1. Neon – Argon – Oxygen – Xenon.
2. Fluorine – Water – Bromine – Carbon.
3. Electric heater – Electric iron – Electric fan – Electric stove
4. Wheat – Pea – Corn – Bean – Pine.

C **Give a reason for :**

A piece of wood floats on water surface, while a piece of lead sinks in it.

Question 2

A **Put (✓) or (✗) :**

1. Each substance has a definite melting point. ( )
2. The motion of gaseous molecules is limited. ( )

3. All mammals walk on four limbs. ( )
4. Birds migration is an acquired behaviour. ( )

B Mention an example of each of the following :

1. Very active metal.
2. A solid substance which is soft at room temperature.
3. A plant carries large - sized leaves. 4. An edentate animal.

C What happens when ... ?

Dipping two different metals connected by a wire in an acidic solution.

Question 3

A Write the scientific term :

1. The simplest form of matter which can't be analyzed into simpler form.
2. The number of positive protons in the nucleus.
3. The product of multiplying the force by the displacement.
4. Plants that can't be distinguished into roots, stems and leaves.

B Complete the following :

1. Hydrogen molecule consists of .... atom(s), while argon molecule (inert gas) consists of .... atom(s)
2. .... and .... are from principles used in classifying plants.

C Compare between :

P.O.C	Angiosperms	Gymnosperms
1. Definition :	....	....
2. Example :	....	....

Question 4

A Choose from column (B) what suits in column (A) :

(A)	(B)
1. Helium	a. used in making jewels
2. Aluminium	b. used in making handles of screwdrivers.
3. Plastic	c. used in making heating coils.
4. Nickel chrome	d. used in making cooking pans.
	e. used in filling balloons during festivals.

B Write the symbols of the following elements :

1. Sodium. 2. Calcium. 3. Aluminium. 4. Chlorine.

C What is the function of each of the following :

1. The paddles of whales and dolphins.
2. The two wings of a bat.

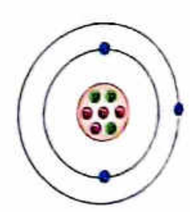
5 Cairo Governorate — Alfarouk Islamic Language School

Answer the following questions :

Question 1

A Complete the following statements :

1. When some metallic spheres are put in a container and shaken, the temperature of the spheres increases as .... energy changes to .... energy.
2. Spare parts of cars are coated with grease to protect them from ....
3. When a bottle of perfume is opened, its odour spreads. This is because molecules of matter are in continuous ....
4. The symbol of potassium is .... while that of gold of ....
5. Monkeys have .... to climb trees and catch things.
6. The diagram represents an atom. This atom has a mass number of ....



B Give reasons for :

1. Some animals hide in humid burrows in summer.
2. Solids keep their shape and volume.

C Match :

(A)	(B)
1. Rubber	a. potential energy + kinetic energy.
2. Bat	b. the smallest building unit of a matter that can exist freely and carry the properties of matter.
3. Molecule	c. good electric conductor.
4. Mechanical energy	d. soft at ordinary temperature.
	e. $\frac{1}{2}\times$ mass $\times$ (speed)^2
	f. front limbs are modified into wings.

Question 2

A Choose the correct answer :

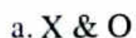
1. In a kettle, hot water rises up by ....

   a. radiation. b. convection. c. conduction. d. condensation.

2. An iron ball at 60°C is dropped in a beaker containing water at 40°C. the heat will ....

   a. flow from the iron ball to the water.
   b. flow from the water to the iron ball.
   c. not flow from the iron ball to the water or from the water to the iron ball.
   d. none of the above.

3. Which points has the same potential energy ? ....



   a. X & O
   b. Y & Z
   c. X & Z
   d. P & Y

4. .... are birds that migrate in winter.

   a. Quails b. Ducks c. Bats d. Geese

5. When a student adds 200 ml of ethyl alcohol to 300 ml of water in a cylinder, he finds that the volume of the mixture was less than 500 ml as he expected. This is because ....

   a. Water evaporates quickly.
   b. The molecules of alcohol are in a continuous motion.
   c. Some alcohol may have spilt down when putting it in the cylinder.
   d. Alcohol molecules distribute within the space between water molecules.

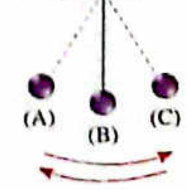
6. An object has a mass of 45 grams and a volume of 30 cm^3. What is the density of the object ? ....

   a. 0.2 gm/cm^3 b. 1.5 gm/cm^3 c. 5 gm/cm^3 d. 20 gm/cm^3

7. How many electrons are there in the last energy level of the atom with atomic number 7 ? ....

   a. 3 b. 4 c. 2 d. 5

8. From the following figure, maximum kinetic energy is at point ....



   a. A
   b. A & C
   c. B
   d. C

B What is the gravitational potential energy stored in a 55 kg teenager sitting at the top of a 4 m high tree ? (The Earth's gravity equals 10 N/kg).

C Cross the odd word out and write the relation among the others :

1. Sulphur – Silver – Phosphorus – Air.
2. Julius – House fly – Honey bee – Ant.
3. Maize – Pine – Wheat – Pea.
4. Tiger – Lion – Rabbit – Sloth.

Question 3

A Correct the underlined words :

1. In the simple electric cell, **heat** energy converts to electric energy.
2. **Ammonia** molecule is formed of 1 hydrogen and 1 chlorine atoms.
3. Insectivorous plants need nitrogenous substances to build **carbohydrates**.
4. **Nickel chrome** alloy is used in making jewels.
5. Birds like **hawks** have wide indented beaks to feed on fish and mosses.
6. The energy level K is saturated by **8** electrons.
7. **Gold** easily reacts with oxygen when exposed to humid air.
8. **Adiantum** is a unicellular organism.

B What is meant by ... ?

Species.

C Give an example of :

1. A device that changes electric energy to kinetic energy.
2. Functional adaptation.
3. Monoatomic liquid element.
4. Animal with external support.

Question 4

A Write the scientific term :

1. The work done by an object during its motion.
2. The science that deals with classifying living organisms into groups according to their similarities and differences to ease their study.
3. The ability of some living organisms to hide from their enemies.
4. A substance which is formed due to the combination of two or more atoms of different elements with constant weight ratios.
5. It is the temperature at which the matter begins to change from the solid state to the liquid state.
6. The measuring unit of energy.
7. The amount of energy gained or lost by an electron to transfer from an energy level to another.
8. Modification of living organism's behaviour or body structure or function of its organs to adapt with environmental conditions.

B What happens when a piece of iron is put in a bowl filled with water ? Why ?

C Phosphorous has the following formula :

31 P 15

1. Phosphorous atom has :
   a. .... neutrons in its nucleus
   b. An atomic number of ....
   c. An electronic configuration of ....
2. Is it chemically active or an inactive element ? ....

6 Cairo Governorate — Manaret El-Eman Language Schools

Answer the following questions :

Question 1

A Write the scientific term :

1. It is the temperature at which the substance changes from solid state to the liquid state.
2. The spaces between molecules.
3. The ability to do work or to make a change.
4. The way by which the heat is transferred through solids.

B Give reasons for :

1. Balloons of hydrogen and helium rise up in the air.
2. The nucleus of the atom is positively charged.
3. The freezer is found at the top of the fridge.
4. Amoeba is from micro-organisms.

C Write the electronic configuration for the following elements, then :

1. Calculate the number of neutrons.
2. Determine if the atom is active or inactive and mention the reason.
   a. $^{35}_{17}Cl$
   b. $^{16}_{8}O$

Question 2

A Complete the following statements :

1. The front limbs of dolphins are modified into .... to perform the role of ....
2. The liquid elements that its molecule consists of only one atom is .... while that consistants of two atoms is ....
3. From the teethless mammals are .... and ....
4. An alloy of .... is used in making jewels, while an alloy of .... is used in making heating coils.

B **What happens when ... ?**

1. Putting a drop of ink in water.
2. Rubbing your hands together.
3. An electron in "K" energy level gains a quantum of energy.
4. Predatory plants can't capture insects for a long time.

C **Problem :**

Find the weight of an object of potential energy 88 joule when it is found at a height of 11 m.

Question 3

A **Put (✓) or (✗), then correct the wrong ones :**

1. Molecules of the same substance are different from each other. ( )
2. Mass number is the sum of protons and electrons. ( )
3. Hibernation of some reptiles and some insects is structural adaptation. ( )
4. Pea plant belongs to dicotyledon. ( )

B **Compare between (one point only) :**

1. Insects and arachnids.
2. Kinetic energy and potential energy.
3. Sodium and gold. (chemical activity)
4. Protons and electrons. (charge)

C **Mention one example of each of the following :**

1. Insectivores plant.
2. An animal which doesn't have a body support.

Question 4

A **Choose the correct answer :**

1. On adding 100 cm^3 of water to 100 cm^3 of alcohol, the volume of mixture equals .... cm^3.

   a. 100 b. 200 c. 180 d. 210

2. An object has a kinetic energy 64 joule and its mass 8 kg, so its speed equals ....

   a. 16 m/sec. b. 8 m/sec. c. 4 m/sec. d. 2 m/sec.

3. The plant that reproduces by spores is ....

   a. pine. b. bean. c. vougheir. d. maize.

4. Sodium is symbolized by ....

   a. Hg b. S c. Si d. Na

B **Mention one difference :**

1. Fish and desert snail (body support).
2. Helium and hydrogen.
3. Element and compound.
4. Transfer of heat by convection and transfer of heat by radiation.

C **What is the function of each of the following ... ?**

1. The elongated front limbs in monkey.
2. Strong and sharp crooked beaks in hawks.

7 Giza Governorate — Modern Narmer Language School

Answer the following questions :

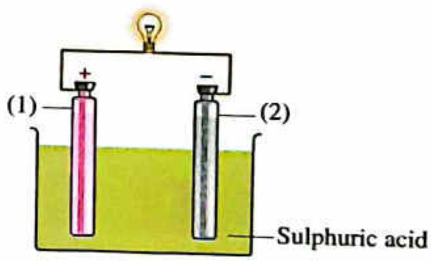
Question 1

A **Complete the following statements :**

1. When an object is moved upwards, the energy changes from .... to ....
2. The gaseous element whose molecule is composed of 2 atoms is .... while that which is composed of one atom is ....
3. The amount of energy needed or lost to transfer an electron from energy level to another is called ....
4. Heat transfers in solids by .... but it transfers in gases by ....
5. The front limbs in bats are modified into ....

B **Examine the opposite figure :**

1. What is name of the figure ?
2. Complete labels (1) and (2).
3. What happens when you connect (1) and (2) with an electric wire ?



C **Write the chemical symbol of each of the following elements :**

1. Calcium. 2. Silver. 3. Potassium.
4. Iron. 5. Mercury. 6. Carbon.

Question 2

A **Write the scientific term :**

1. Positively charged particles in nucleus of an atom.
2. Temperature at which a substance changes from solid state to liquid state.
3. Smallest part of matter that can exist freely and has properties of the substance.
4. The energy which is stored in an object due to work done on it.

B **A body of mass 6 Kg moves with speed 4 m/s, Calculate kinetic energy of this body.**

C Join the correct pairs from the column (A) and (B) :

(A)	(B)
1. In making cooking pots we use	a. silver.
2. In making handles of screwdriver we use	b. oxygen and hydrogen.
3. To distinguish between iron and gold we use	c. oxygen only.
4. Water molecule is made from	d. aluminium.
5. In making jewels we use	e. color.
	f. plastic.

Question 3

A What is the element which has the following symbol :

1. Si 2. Cu 3. H 4. Zn 5. Na

B Give reasons for :

1. In normal conditions, atoms of elements are electrically neutral although they contain positive and negative particles.
2. Hawks have strong and sharp beaks.
3. It is better to place the electric heaters down on the ground.
4. In atoms of elements the mass number is greater than the atomic number.

C What is meant by ... ?

1. Camouflage. 2. The compound.

Question 4

A Choose the correct answer :

1. In cold winter, some animals bury themselves in mud to overcome the decrease in temperature, this is called ....
   a. aestivation. b. migration. c. hibernation. d. taxonomy.
2. Chemical energy can be stored in ....
   a. car battery. b. raising an object upwards.
   c. electric lamp. d. a moving car.
3. The energy level (N) is saturated with ....
   a. 2 electrons. b. 32 electrons. c. 8 electrons. d. 18 electrons.
4. An object its mass 5 kg is placed at height 2 m, acceleration due to gravity is 10 m/s^2, thus weight of the object equals ....
   a. 10 N. b. 100 N. c. 50 N. d. 20 N.
5. The organisms which have 4 pairs of joined legs are the ....
   a. insects. b. snails. c. worms. d. arachnids.

B A piece of copper its volume is 200 cm^3 and has a mass 164 grams, calculate density of copper.

C The following are atoms of 3 elements :

1. $^{16}_{8}O$ 2. $^{35}_{17}Cl$ 3. $^{40}_{20}Ca$

a. Write electronic configuration of each atom.

b. Find number of energy levels in each atom.

8 Giza Governorate — 6th October Directorate

Answer the following questions :

Question 1

A Complete the following statements :

1. Potential energy of body depends on .... and ....
2. Helium molecule consists of .... atom while hydrogen molecule consists of .... atom.
3. The .... and .... solutions are good conductors of electricity.
4. .... is permanent resource of energy.
5. An alloy of .... is used in making jewels but an alloy of .... is used in heating coils.
6. Solar heater changes .... energy to .... energy.

B Give reasons for :

1. The atom is electrically neutral.
2. Some birds have wide indented beaks.

C Write the chemical symbol for each :

1. Potassium. 2. Iron. 3. Carbon. 4. Oxygen.

Question 2

A Choose the correct answer :

1. From the substances that float on water is ....
   a. iron. b. oil. c. copper. d. aluminium.
2. From animals with soft bodies ....
   a. snail. b. jellyfish. c. snake. d. turtle.
3. Heat transfers by conduction through ....
   a. gases only. b. liquids only. c. solid only. d. vacuum only.

4. The attraction force between solids is ....
   a. strong. b. weak. c. medium. d. infinity.
5. Taste property distinguish between ....
   a. milk and honey. b. silver and gold. c. wood and plastic. d. iron and copper.
6. Electric lamp changes the electric energy into .... energy.
   a. light b. sound c. chemical d. magnetic

B Define :

1. Element.
2. Mechanical energy.

C Give one example for each :

1. Substance soft at room temperature.
2. Substance sink in water.
3. Very active metals.
4. Arthropods have 3 pairs of jointed legs.

Question 3

A Write the scientific term :

1. Temperature at which matter begins to change from solid to liquid.
2. Invertebrates which have jointed legs.
3. Work done during the motion of an object.
4. Modification in organisms body structure or function of its organs to be adapted.
5. Atom that gains a quantum of energy.
6. The sum of protons and neutrons in nucleus.

B Write electronic configuration form each :

1. $^{7}_{3}Li$
2. $^{20}_{10}Ne$

C Find the density of a piece of iron if its mass 78 gm and its volume 10 cm^3

Question 4

A Put (✓) or (✗), then correct the wrong ones :

1. Cold air rises up and hot air falls down. ( )
2. Iron rusts when exposed to wet air. ( )
3. Webs of cellular phone cause water pollution. ( )
4. Animals can be classified according to body support. ( )
5. Boiling point is the temperature which matter changes from liquid to gas. ( )
6. Heat transfers in space by radiation. ( )

B Compare between solid and gas in regarding (intermolecular space, examples).

C A ball launched upwards at a speed 3 m/s up to height 4 m find the kinetic and potential energies of the ball if its weight is 5 newton and has a mass 0.5 kg.

9 Giza Governorate

Egypt Dream Language School

Answer the following questions :

Question 1

A Choose the correct answer :

1. An object its kinetic energy is zero when the object is at the ....
   a. maximum height. b. Earth's surface. c. midpoint. d. no correct answer.
2. Resources of permanent energy is ....
   a. Sun. b. coal. c. petrol. d. nuclear reaction.
3. When the atomic number of an element equals to its mass number this means that there is no ....
   a. electrons. b. protons. c. neutrons. d. nucleus.
4. Chemical energy can be stored in ....
   a. car lamp. b. raising a load upwards.
   c. sound. d. car battery.

B Write electronic configuration then calculate :

$^{39}_{19}K$

a. Write the symbol name. b. The mass number.
c. The number of neutrons. d. The number of electrons in the outer level.

C Calculate the potential energy of :

An object of 20 N weight is placed at 5 m height.

Question 2

A Give reasons for :

1. Spider isn't considered from insects.
2. The nucleus is electrically positive.
3. The freezer of the fridge is found at the top of the fridge.
4. Cooking pots are made of copper or aluminium.

B Give an example for each of the following :

1. Inert (Noble) gas.
2. A device converts solar energy into electric energy.
3. Solid substances are soft in room temperature.
4. Hibernation in amphibia.

C Show by drawing the electric configuration for each of the following atoms :

1. $^{40}_{20}Ca$ 2. $^{32}_{16}S$

Question 3

A Complete the following statements :

1. Sodium symbol is ...., where nitrogen symbol is ....
2. The photosynthesis process changes .... energy into .... energy.
3. The positive pole in simple electric cell is .... , while the negative pole is ....
4. .... and .... are from examples of micro-organisms.

B Write the scientific term :

1. The energy level that has the highest energy.
2. Amount of energy needed or lost to transfer an electron from an energy level to another.
3. The measuring unit of density
4. It is a branch of biology that searches for the similarities and the differences among living organisms and it places the similar ones in groups according to a certain system.

C Choose the odd word :

1. Wax – Aluminium – Butter – Ice.
2. Acidic solution – Sugar solution – Salt solution – Alkaline solution.

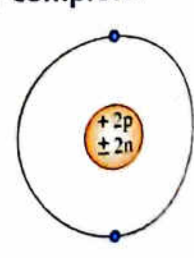
Question 4

A Rewrite the following statements after correcting the underlined words :

1. **Protons** are neutral charged particles.
2. The **kinetic energy** of an object increases by the increase of the weight and height.
3. An alloy of **iron and cobalt** is used in making jewels.
4. The transfer of heat in gases and liquids by **conduction**.

B The opposite figure represents the electronic configuration of an atom, complete :

1. The atomic number ....
2. The number of electrons ....
3. The mass number ....
4. The elements is considered .... (active – inactive) gas.



C Mention the type of adaptation of each of the following :

1. Birds migration.
2. Secreting poison in snake.

10 Giza Governorate — North Giza Directorate

Answer the following questions :

Question 1

A Complete the following statements :

1. The nucleus of an atom contains .... and ....
2. The front limbs in whale are modified into .... , while in bat are modified into ....
3. Copper - gold alloy is used in making .... , while nickel - chrome alloy is used in making ....
4. Heat transfers through solids by .... and through liquids by ....

B What happens when ... ?

1. Cold object touches hot object.
2. An electron gains a quantum of energy.
3. The mass number in an atom equals the atomic number.
4. The ball of pendulum reaches to the maximum height. (concerning to K.E and P.E)

C What is meant by ... ?

1. Molecule.
2. Taxonomy

Question 2

A Mention one example for :

1. Solution conducts electricity.
2. Renewable source of energy.
3. Fern plant.
4. Monoatomic element.

B Correct the underlined words :

1. Camel has **hoof** to walk in sand.
2. **Coal** is soft at room temperature.
3. **Fish** have external body support.
4. The intermolecular spaces are narrow among molecules of **liquids**.

C Write the symbols of the following elements :

1. Mercury.
2. Sodium.

Question 3

A Mention one deference between :

1. Hedgehog and sloth.
2. Gold and potassium.
3. Element and compound.
4. Simple cell and solar cell.

B **Write the scientific term :**

1. The basic classification unit of living organisms.
2. Imaginary regions around the nucleus in which electrons revolve in it.
3. The temperature at which the matter changes from liquid state to gaseous state.
4. Mass of unit volume of substance.

C **Solve the Problem :**

Find the potential energy of an object its mass = 5 kg and found at a height of 4 meters from the ground. [$g = 10\ m/s^2$].

Question 4

A **Give reasons for :**

1. Atom is electrically neutral.
2. Spider belongs to arachnids while ant belongs to insects.
3. Air conditioner is fixed at the top of a room.
4. Iron sinks in water, while wood floats on water.

B **Choose the correct answer :**

1. The attraction force among molecules of gases is ....
   a. strong. b. weak. c. almost not existed.
2. Chemical energy is changed into heat energy in ....
   a. car engine. b. dynamo. c. photosynthesis process.
3. Pea plant belongs to .... plants.
   a. monocotyledon b. dicotyledon c. gymnosperm
4. The density of mass 8 gm of cork whose volume 16 cm^3 is ....
   a. 2 gm/cm^3 b. 5 gm/cm^3 c. 0.5 gm/cm^3

C **Write the electric configuration of the following :**

1. $_{12}Mg$ 2. $_{20}Ca$

11 Alexandria Governorate

Taymour English School

Answer the following questions :

Question 1

A **Write the scientific term :**

1. The spaces found among the molecules of matter.
2. Energy is neither created nor destroyed but can change from one form to another.
3. It is a behaviour through which some animals escape from high temperature in summer.

4. Changing of kinetic energy to heat energy when two surfaces are touching each other.
5. Imaginary places around the nucleus and they are symbolized by K , L , M , N , O , P and Q.
6. Transferring of heat through vacuum.
7. Permanent and clean source of energy.

B What is the type of species in the following ... ?

1. Cycas and pine plant.
2. Jellyfish.

C Calculate the mass of a body whose density is 4.5 gm/cm^3 and its volume is 3 cm^3

Question 2

A Give reasons for :

1. The atom is electrically neutral.
2. It is preferred to put the heater on the ground.
3. We cannot put off petrol fires with water.
4. Some plants eat insects.

B A ball of mass 0.25 kg is raised to a maximum point at a height 6 m. Calculate its potential energy and kinetic energy at : (Knowing that acceleration due to gravity = 10 m/sec^2)

a. Maximum height.
b. 4 meters height.

C Correct the underlined words :

1. **Boiling** is the temperature at which liquids start to change into gases.
2. **Hydrogen** gas is a compound.
3. Scorpion is from **myriapods**.
4. In **dynamo**, chemical energy is changed into electric energy.

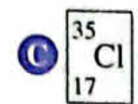
Question 3

A Complete the following statements :

1. The energy level .... is filled with 32 electrons according to the rule ....
2. Heron has long and .... beaks to pick up ....
3. You are not doing a work when the displacement = ...
4. On heating a solid object, the intermolecular forces become ....
5. .... is the symbol for potassium.
6. The hardness of .... is more than that of copper.

B What happens if ... ?

1. You put 200 cm^3 ethyl alcohol to 400 cm^3 water (and why ?).
2. The atom gained a quantum of energy.
3. The number of neutrons inside an atom is zero.

C 

1. Draw its electronic configuration.
2. Name this element.
3. Find the number of its neutrons.

Question 4

A **Cross out the odd word and write the scientific term of the rest of the words :**

1. Potassium – Copper – Sodium.
2. Mass – Velocity – Height.
3. Fish – Snail – Crocodile.

B **Compare between (1 point for each) :**

1. Salt solution and sugary solution.
2. Oil and oxygen (according to the motion of molecules).
3. Neutrons and electrons.
4. Armadillo and hedgehog.

C **Choose the correct answer :**

1. Vougheir plant belong to ....
   a. plants that reproduce by formation of seeds.
   b. plants that are not distinguished into roots, stem or leaves.
   c. plants that reproduce by formation of spores.
   d. plants that are not gymnosperms.
2. Television produces ....
   a. electric energy
   b. chemical energy
   c. light and sound energy
   d. kinetic energy
3. The front limbs of dolphins are modified into ....
   a. tails to swim.
   b. wings to fly.
   c. elongated limbs to swim.
   d. paddles to swim.
4. The mathematical formula used to calculate work is : ....
   a. force + displacement.
   b. potential energy + kinetic energy.
   c. weight + height.
   d. mass × velocity.
5. .... is an inactive metal.
   a. Gold
   b. Iron
   c. Aluminium
   d. Carbon
6. .... is a diatomic liquid element.
   a. Iodine
   b. Mercury
   c. Water
   d. Bromine
7. From the organisms that can make camouflage ....
   a. horse.
   b. adiantum.
   c. chameleon.
   d. earthworm.

12 Alexandria Governorate

El-Montazah Directorate

Answer the following questions :

Question 1

A Complete the following statements :

1. Solar cell is used to change .... energy into .... energy.
2. Cockroach has .... pairs of jointed legs while bee has .... legs.
3. Heat transfers through space by .... while it transfers through solids by ....
4. Mercury molecule has .... atom(s) while argon molecule has .... atom(s).
5. The symbol of magnesium is .... while the symbol of sulphur is ....

B Cross the odd word out :

1. Cow – Fish – Dolphin – Jellyfish.
2. Ammonia – Table salt – Hydrogen chloride – Hydrogen.
3. Aluminium – Gold – Iron – Copper.
4. Rat – Squirrel – Jerboa – Rabbit.

Question 2

A Choose the correct answer :

1. Some animals are called rodents such as ....
   a. armadillo. b. hedgehog. c. rabbit. d. rat.
2. Secretion of sweat in the human is .... adaptation.
   a. structural b. behavioural c. anatomical d. functional
3. The potential energy of an object at height 8 meters is 800 j. the weight of an object is .... newton.
   a. 60 b. 100 c. 1600 d. 200
4. As we go further from the nucleus the energy level ....
   a. increases. b. decreases. c. doesn't change. d. reduces.
5. The .... bird migrates from a cold region to a warm region for reproduction.
   a. pigeon b. vulture c. quail d. geese
6. When the substance sinks in the water surface means its density ....
   a. Less than $1 gm/cm^3$ b. more than $1 gm/cm^3$
   c. equal $1 gm/cm^3$ d. half density of water.

B **Mention one difference between :**

1. A very active metal and inactive metal.
2. Angiosperms and gymnosperms.

C **A ball at height 4 m from the ground and its weight = 800 newton find :**

1. The kinetic energy at the maximum height.
2. The potential energy at the maximum height.

Question 3

A **Correct the underlined words :**

1. The melting point of table salt is **equal to** the melting point of the wax.
2. The N level is saturated with **8** electrons.
3. Heat of the Sun is transferred to the Earth through space by **conduction**.
4. The beak of the **hawk** is long and thin to pick up snails.
5. From the insectivores plant **pine**.
6. The relation needed to find the number of electrons in each energy level is $\mathbf{n^2}$.

B **Explain by drawing the electronic configuration of the following element**

1. $^{24}_{12}Mg$
2. $^{36}_{16}Ar$

Then explain the chemical activity of each element.

C **What is meant by the density of water = 1 gm/cm^3 ... ?**

Question 4

A **Write the scientific term :**

1. Mass of unit volume.
2. The temperature at which the substance begins to change from liquid to gas.
3. Amount of energy that gained or lost by the electron to transfer.
4. Alloys are used to make jewels.
5. Compound consists of two hydrogen atoms and one oxygen atom.
6. A permanent source of energy.

B **Mention an example :**

1. A bird feeds on fish and mosses has a wide beak.
2. A tool changes the electric energy into heat energy.
3. A plant has no roots or stems or leaves.
4. A solution allows the electric current to pass.

C **Find the mass of a piece of iron its volume = 3 cm^3 and the density of iron is 7.8 gm/cm^3**



13 Alexandria Governorate

El-Agamy Directorate

Answer the following questions :

Question 1

A Choose the correct answer :

1. We can distinguished between .... according to the electric conductivity.
   a. copper and iron b. copper and wood c. wood and plastic d. air and plastic
2. The measuring unit of work done is ....
   a. kilogram. b. newton. c. gm/cm^3 d. joule.
3. From teethless mammals ....
   a. sloth. b. tiger. c. squirrel. d. hedgehog.
4. The diatomic liquid is ....
   a. bromine. b. mercury. c. helium. d. nitrogen.
5. The number of electrons in the outer level of $_{17}Cl$ is ....
   a. 3 b. 8 c. 17 d. 7
6. Cycas belongs to ....
   a. algae. b. angiosperms. c. gymnosperms. d. ferns.

B Give reasons for :

1. The volume of mixture of water and alcohol is less than the sum of them.
2. The camel's leg end with thick flat pad.
3. The heater is put near the bottom of room.
4. The atom is electrically neutral.

Question 2

A Write the scientific term of the following :

1. Temperature at which liquid state starts to change into gaseous one.
2. Branch of biology that research the similarities and differences among living organisms and put similar in one group to ease their study.
3. Energy stored in an object due to work done.
4. The amount of energy which lost or gained by electron to transfer from energy level to another.
5. The ability of living organisms to hide from enemies by simulate the dominant natural conditions in their environment.

B Give one example :

1. Myriapod. 2. Permanent source of energy.
3. Inert gas. 4. Ferns. 5. Alloy used in making cooking pots.

C What is meant by ... ?

1. Molecule. 2. Species.

Question 3

A Complete the following :

1. The density is the .... of unit volume and its measuring unit ....
2. When the body rise up its potential energy .... and its kinetic energy ....
3. Insects belong to .... and have .... pairs of jointed legs.
4. Front limbs of bat are modified into .... to ....
5. The method of transfer heat through copper is .... while the method of transferring the heat of Sun to us is ....

B Write the electronic configuration of the following :

1. $_{11}Na$ 2. $_{7}N$ 3. $_{20}Ca$ 4. $_{2}He$

C Problems :

1. If the mass of object 5 kg find its potential energy at 2 m height (if the acceleration due to gravity = 10 m/sec^2)
2. If the car move by speed 2 m/sec. calculate its kinetic energy if its mass 10 kg.

Question 4

A Put (✓) in front of correct statement and (✗) in front of wrong once :

1. Secreting poison in snake considered as structural adaptation. ( )
2. The symbol of sodium (S) and the symbol of potassium (P). ( )
3. The potential energy at maximum height equal zero. ( )
4. The charge of electrons is negative and protons is positive. ( )
5. Pine plant and cycas from angiosperms. ( )
6. Arachnids like spider have 8 jointed legs. ( )

B What happens when ... ?

1. The electron gain amount of energy.
2. Frogs can't make hibernation.
3. The weight of object is doubled at constant height (according to potential energy).
4. Heating an amount of water (according to intermolecular space and intermolecular force).

14 AL Qalyoubia Governorate

Science Inspectorate

Answer the following questions :

Question 1

A Complete the following statements :

1. .... alloy is used in making jewels, while .... alloy is used in making heating coils.
2. The monoatomic liquid is .... , while the diatomic liquid is ....
3. In photosynthesis process, ... energy changes into .... energy.
4. Mussels are from animals that have .... support, while fish are from animals that have .... support.

B Give an example of each of the following :

1. A very active metal.
2. A micro-organism.
3. A noble gas.
4. A substance that has low melting point.

C A piece of marble, its mass is 100 gram is immersed in a measuring cylinder containing water, then water raised from 40 cm^3 to 60 cm^3. What is the density of the marble.

Question 2

A Write the scientific term for each of the following :

1. The atom that gains a quantum of energy.
2. A set of similar animals in their shape and can reproduce to give new fertile individuals.
3. Energy is neither created nor destroyed, but it is converted from one form to another.
4. The result of the combination between two or more atoms of different elements with constant weight ratios.

B Correct the underlined word (s) :

1. Transfer of heat by **conduction** doesn't need a material medium.
2. **Pea plant** reproduces by formation of spores.
3. **Sugary** solution is a solution which is good conductor of electricity.
4. **Copper** rod is the negative pole in the simple electric cell.

C A moving pendulum has a potential energy of 0.8 joule at maximum displacement. If the mass of its ball is 0.08 kg and acceleration due to gravity is 10 m/s^2. Calculate the height of the pendulum at maximum displacement.

Question 3

A Put sign (✓) or (×) in front of each of the following, then correct the wrong one :

1. Smell property is a distinguishing factor between perfume and ammonia. ( )
2. When air is cooled, its density decreases, so it falls down. ( )
3. Angiosperms are called flowering plants. ( )
4. Melting point is the temperature at which the matter changes from solid state to liquid state. ( )

B Write the electronic configuration for each of the following :

1. Calcium $^{40}_{20}Ca$. 2. Chlorine $^{35}_{17}Cl$. 3. Nitrogen $^{14}_{7}N$. 4. Argon $^{40}_{18}Ar$.

C Choose the odd word out, and give a reason for your choice :

Ice – Wood – Cork – Iron

Question 4

A Choose the correct answer from each of the following :

1. Which of the following devices pollutes the environment ? ....
   a. Gas oven. b. Electric oven. c. Electric heater. d. Solar heater.
2. Birds migration represents .... adaptation.
   a. structural b. behavioural c. functional d. anatomical
3. An example of a living organism that undergoes hibernation is ....
   a. frog. b. jerboa. c. desert snail. d. sloth.
4. Equal masses of different substances have .... volumes.
   a. constant b. equal c. similar d. different

B Compare between each of the following :

1. Solids and gases (according to the attraction force).
2. Sodium and copper (according to the chemical activity).

C Write the symbol of each of the following :

1. Sulphur. 2. Iron. 3. Potassium. 4. Helium.

15 El Menofia Governorate — Menouf Directorate

Answer the following questions :

Question 1

A Complete the following statements :

1. Density measuring unit is .... so density equal mass over ....
2. The product of force × displacement is ...., its unit is ....

3. The symbol of sodium is .... while the symbol of potassium is ....
4. .... and .... are teethless mammals.

B Write the number which indicates the following :

1. The number of energy levels in the largest known atom is ....
2. Potential energy = kinetic energy = ... mechanical energy (in the middle distance of the height between the top and the ground).
3. An object of mass 2 kg moves with a speed of 4 m/s has a kinetic energy .... joule.
4. The smallest atomic number of an element which its electrons rotating around the nucleus in 3 energy levels in ordinary state is ....

C Give a reason for :

Some table salt disappears after a while when added to water without stirring.

Question 2

A Choose the correct answer :

1. If the nucleus of carbon atom contains 6 protons and 6 neutrons, so the atomic number equal .... in the stable state.
   a. 12 b. 6 c. 8 d. 16
2. .... is the density of 35 gm of a substance that occupies 25 cm^3.
   a. 14 gm/cm^3 b. 1.4 gm/cm^3 c. 4 gm/cm^3 d. 1 gm/cm^3
3. The energy in the .... changes from potential energy into kinetic energy and vice versa.
   a. car battery b. simple electric cell c. simple pendulum d. fan motor
4. .... is an example of the plants which feed on insects.
   a. Vougheir b. Dieonea c. Cycas d. Wheat

B Put (✓) or (✗) :

1. Hedgehog has front teeth extending outwards. ( )
2. Substances have different chemical properties. ( )
3. Atomic number is the number of neutrons in nucleus. ( )
4. Microorganisms spread out every where around us in air, soil and water. ( )

C Compare between :

Transfer of heat by conduction and radiation (concerning the medium that transfer through it).

Question 3

A Mention the scientific term :

1. It is a branch of biology searching the similarities and differences among living organisms.
2. Energy is neither created nor destroyed but it is converted from one form to another.

3. It is the temperature at which matter begins to change from a liquid state to a gaseous state.

4. The smallest particle of the matter that can share in chemical reactions.

B **Choose odd word out :**

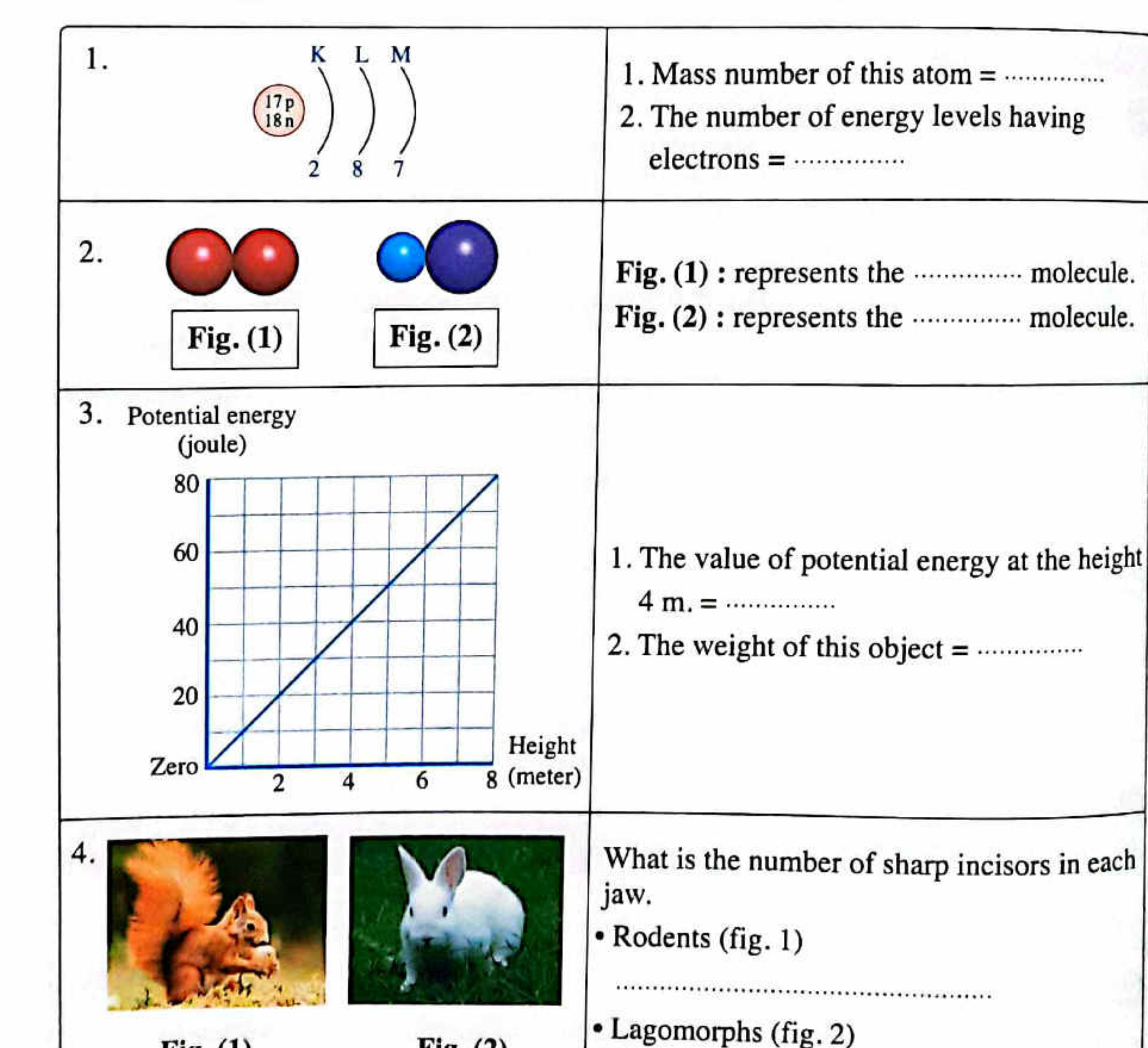
1. Solar cell – Dynamo – Dry cell – Motor.
2. Sun – Coal – Petrol – Natural gas.
3. Water – Oil – Alcohol – Water vapour.
4. $_{1}H - {}_{8}O - {}_{17}Cl - {}_{18}Ar$

C **Give one difference between :**

Insects and arachnids.

Question 4

A **Study these figures well then determine each of the following :**



1. K L M; 17 p 18 n; 2 8 7	1. Mass number of this atom = …………… 2. The number of energy levels having electrons = ……………
2. **Fig. (1)** **Fig. (2)**	**Fig. (1) :** represents the …………… molecule. **Fig. (2) :** represents the …………… molecule.
3. Potential energy (joule): 80, 60, 40, 20, Zero; Height (meter): 2, 4, 6, 8	1. The value of potential energy at the height 4 m. = …………… 2. The weight of this object = ……………
4. **Fig. (1)** **Fig. (2)**	What is the number of sharp incisors in each jaw. • Rodents (fig. 1) …………………………………………… • Lagomorphs (fig. 2) ……………………………………………

B Choose the correct word from the brackets :

(carbon – copper – radiation and convection – structural – equals – more than – functional – convection only).

1. Density of 12 gm from pure iron .... the density of 2 gm from it.
2. .... is a good conductor matter for heat and electricity.
3. Secreting poison in snakes is considered a .... adaptation.
4. Heat transfers from a heater by ....

C What happen when ... ?

Dipping two different metals connected by a wire in an acidic solution.

16 Dakahlia Governorate — Science Inspectorate

Answer the following questions :

Question 1

A Complete the following statements :

1. Ammonia molecule consists of two .... and four ....
2. The outer energy level in $_{16}S$ contains .... electrons but in $_{7}N$ .... electrons.
3. In solar cells the .... energy is direct converted into .... energy.
4. Micro-organisms differ from each other in .... and ....

B Choose the correct answer :

1. Number of electrons that saturate the level N equal ....
   a. 2n　b. n^2　c. $2n^2$　d. $(2n)^2$
2. Substance finds great difficulty to react with oxygen like ....
   a. Na　b. K　c. Fe　d. Au
3. When pulling a string of an arc the work done to pull it is stored in ....
   a. kinetic energy.　b. chemical energy.　c. heat energy.　d. potential energy.
4. Pea plant belongs to .... plant.
   a. ferns　b. monocotyledon　c. dicotyledon　d. gymnosperm

C On determining iron density using a piece of iron of mass 78 gm, the piece is immersed in 100 cm^3 of water the water level rises up to 110 cm^3. Calculate iron density.

Question 2

A Write the scientific term :

1. The temperature at which a substance begins to change from a liquid state into a gaseous state.
2. The simplest pure form of a substance, we could not decompose it chemically into a simpler substance.

3. Cell is composed of an acid solution with two different metals dipped in.
4. The ability of some body organs and tissue to do certain functions.

B **Correct the underlined words :**

1. An element the outer energy level (N) contains one electron and its mass number is 39, so its nucleus contains **18** neutrons.
2. On adding 200 cm^3 from ethyl alcohol to 300 cm^3 of water in a measuring cylinder, the volume of the mixture **equals** 500 cm^3.
3. The organs of birds that are adapted for feeding are the **wings and eyes**.
4. Halophila digest the insects to absorb the nitrogenous substances to form **carbohydrates**.

C **A ball was launched upwards and vertically at a speed 6 m/s up to height 8 m calculate the mechanical energy of the ball if its weight is 10 newton and its mass 0.5 kg.**

Question 3

A **Choose the odd word out, then write the scientific name of the rest :**

1. Electron – Quantum – Proton – Neutron.
2. Ice – Coin –Wood – Oil .
3. Water motion – Food – Nuclear reaction – Electric energy.
4. Gas oven – Coal heater – Petrol stove – Solar oven.

B **Put (✓) or (✗) :**

1. Water is not used in extinguishing petrol fires. ( )
2. The energy of level O is smaller than that of level M. ( )
3. Heat transferred through aluminium pots by convection. ( )
4. Energy is neither created nor destroyed but it cannot be transformed into another form. ( )

C **What is the result based on the following :**

The variety of the ways of motion in mammals. ( )

Question 4

A **Answer according to that in the brackets :**

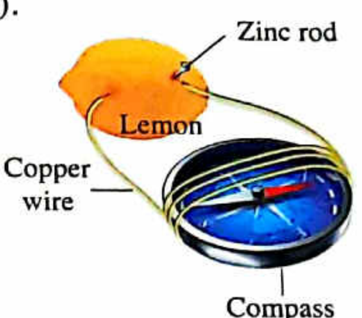
1. $_{20}Ca$ / $_{2}He$ / $_{18}Ar$ [Arrange the element ascendingly according to the number of energy levels].
2. From the figure :

(Mention the modification in the front limbs and why ?).



3. Sugar solution / salt solution / sulphur / alkaline solution
(classify the substances according to their electric conductivity).

4. From the opposite figure :
(What is the scientific idea).



B **Find the mistakes in the following sentences. Then correct them by copying the whole correct sentence in your answer sheet :**

1. Silver element has symbol Si.
2. If an atom loses a quantum of energy the electron transfers from L to N level.
3. African, Asian and Egyptian human belong to different species.
4. Scorpion has five pairs of jointed legs.

C **Give a reason for :**

Some animals undergo hibernation.

17 Gharbia Governorate — East Tanta Directorate

Answer the following questions :

Question 1

A **Complete the following statements :**

1. The liquid element which consists of one atom is ...., while that consists of two atoms is ....
2. The electrons of the potassium atom ($_{19}K$) are distributed in .... energy levels and the outermost energy level contains .... electron(s).
3. As doubling the height to which an object is raised from the ground, the potential energy increases to ....
4. Vertebrates have .... support, while mussels have .... support.
5. Heat is transferred throught iron by ....

B **Choose the odd word out, then write the scientific term of others :**

1. Solar oven – Solar heater – Solar battery – Solar stove.
2. Ammonia – Water – Aluminium – Hydrogen chloride.
3. Nuclear weapons – Car exhaust – Chemical pesticides – Solar cells.
4. Nitrogen – Argon – Helium – Neon.

C **Mention one life application on :**

1. Density.
2. Electric conduction.

Question 2

A **Write the scientific term of the following :**

1. The ability of somebody's organs and tissues to do certain functions.
2. Energy is neither created nor destroyed, but it is converted from one form to another.
3. The space that is found among the molecules of matter.
4. The atom that gains a quantum of energy.

B **Give an example for each of the following :**

1. Ferns.
2. Alloy that is used in making jewels.
3. Lagomorphs.
4. A compound molecule consists of four atoms.

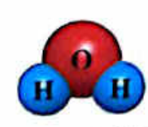
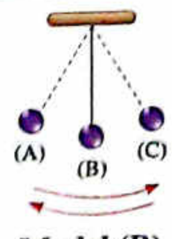
C **Calculate the potential energy of an object its weight is 32 newton and its height is 4 meters.**

Question 3

A **Put (✓) or (✗) then correct the wrong one :**

1. The mass number is always smaller than the atomic number. ( )
2. Cool air falls down, but hot air rises up ( )
3. Iron rusts when it is exposed to dry air. ( )
4. Drosera, halophila, and dieonea are heterotrophic insectivorous plants. ( )

B **Choose the correct answer :**

 Model (A)	1. Model (A) represents .... (ammonia – hydrogen chloride – carbon dioxide – water) 2. The number of elements of the model (A) is .... (1 – 2 – 3 – 4)
 Model (B)	1. Model (B) represents simple pendulum, the potential energy is maximum at position .... (A – B – C – both A, C) 2. If you know that the mechanical energy = 800 joule and kinetic energy = 650 joule at rest position, the potential energy = ... joule. (zero – 150 – 800 – 1450)

C **What happens when ... ?**

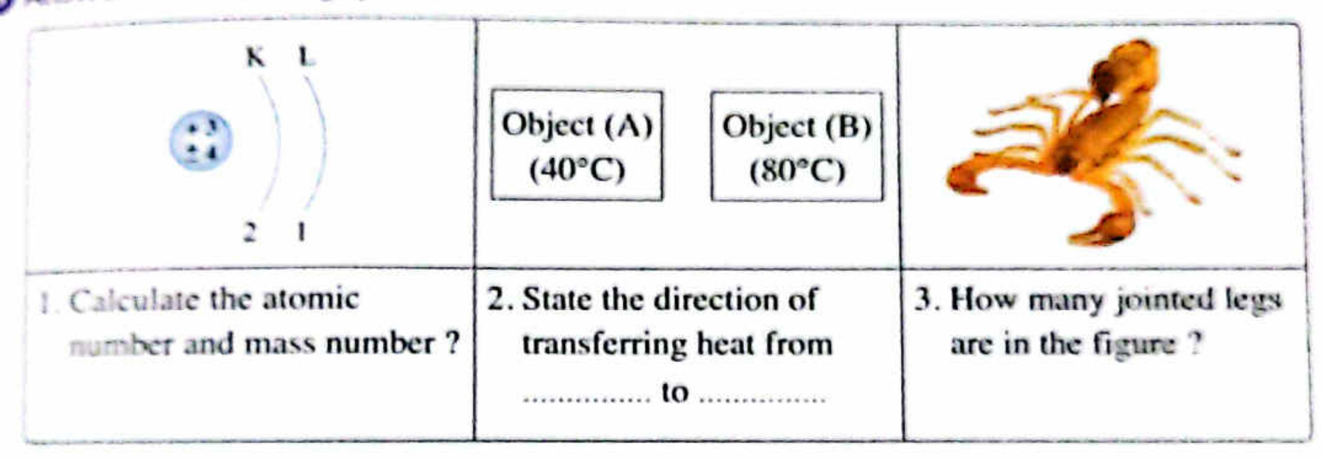
1. Mating between an african man and an asian woman.
2. Chameleon goes from green area to sandy area.

Question 4

A Correct the underlined words :

1. The proton of the atom is **negatively** charged.
2. **Genus** is the basic unit of classification of living organisms.
3. Amoeba is an example of **multi-cellular** organisms.
4. The molecules of a compound consisting of **similar** atoms.

B Answer the following questions :



1. Calculate the atomic number and mass number ?	2. State the direction of transferring heat from .... to	3. How many jointed legs are in the figure ?

C What do you expect ... ?

The beaks of hoopoe and hawk are mutually exchanged.

18 Behira Governorate — Science inspectorate

Answer the following questions :

Question 1

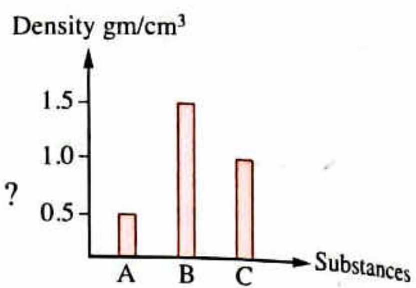
A Complete the following statements :

1. The energy level (M) saturated by .... electrons, which an be calculated from the relation ....
2. Ammonia molecule is composed of three .... atoms, and one .... atom.
3. .... is the ability to do work and its measuring unit is ....
4. Quail birds are adapted to the environmental conditions by .... while jerboa is adapted by ....

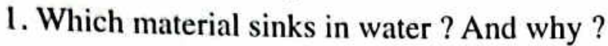
B Write one example for each of the following :

1. Transfer heat by convection.
2. An alloy used in making jewels.
3. Soft substance at room temperature.
4. Device used to change electric energy into light energy.

C **The opposite graph represents the density of substances (A, B and C), study the graph then Answer the following :**



1. Which material sinks in water ? And why ?



2. Calculate the volume of 100 gm sample of material (A) ?

Question 2

A **Choose the correct answer :**

1. In solar heater, the solar energy is converted into ....
   a. light. b. electric. c. heat. d. kinetic.
2. The electrons of potassium atom ($_{19}K$) are distributed in .... energy level(s).
   a. one b. two c. three d. four
3. The symbol of sulphur element is ....
   a. (Ag) b. (S) c. (Si) d. (Hg)
4. The plant which reproduce by spores is ....
   a. pine. b. bean. c. vougheir. d. wheat.

B **Write the number which indicates each of the following :**

1. Number of neutrons in nucleus $^{24}_{12}Mg$ atom.
2. Number of electron in outermost energy level of $^{40}_{20}Ca$ atom.
3. Number of jointed legs of ant.
4. Number of incisors in lower jaw of rodents

C **A ball was kicked up vertically to reach 15 meters high before returning back. If the weight of the ball is 10 newton, calculate its kinetic energy at :**

1. The highest point. 2. The ground.

Question 3

A **Write the scientific term of the following :**

1. The basic classification unit for living organisms.
2. The temperature at which a solid substance starts to change into a liquid one.
3. The smallest particle that can share in the chemical reaction.
4. The way be which heat is transferred through solid.

B **Choose a phrase from column (B) which match another from column (A) :**

(A)	(B)
1. Simple pendulum	a. zinc rod is consider the negative pole.
2. Atomic number	b. a molecule which is formed of similar atoms.
3. Element molecule	c. change chemical energy into kinetic energy.
4. In the simple electric cell	d. change potential energy into kinetic energy and vice versa.
	e. the number of positive protons in the nucleus of an atom.

C Give one difference between :

Maize plant and pine plant.

Question 4

A Choose the odd word, then write the scientific term of the other :

1. Ammonia – Water – Aluminium – Hydrogen chloride.
2. Solar stove – Solar heater – Solar cell – Solar oven.
3. Octopus – Spider – Jellyfish – Earthworm.
4. Acidic solution – Sugary solution – Salt solution – Alkaline solution.

B Correct the underlined words :

1. The nucleus has **neutral** charge.
2. The intermolecular forces between **gaseous** molecules is strong.
3. The networks of wireless transmitters of cellular phones cause **chemical pollution**.
4. The ends of horse are modified into **thick flat pad** to run on rocky soil.

C Give a reason for : Some animals undergo hibernation.

19 Suez Governorate

Suez Directorate

Answer the following questions :

Question 1

A Complete the following statements :

1. The liquid element its molecule is composed of one atom is ...., while that is composed of two atoms is ....
2. In the dynamo, ... energy changes into .... energy.
3. The cockroach belongs to ...., whereas the scorpion belongs to ....
4. Silver symbol is .... whereas sodium symbol is ....

B Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Heat transfers through liquids by	a. excited atom.
2. Electric lamp	b. helium.
3. From inert gases	c. convection and radiation.
4. The atom that gains a quantum of energy	d. is a source of light energy.
	e. is a source of electric energy.
	f. convection.

1. ....   2. ....   3. ....   4. ....

C When a piece of iron its mass 156 gm, is put in a graduated cylinder containing 100 cm^3 of water the reading becomes 120 cm^3 calculate the density of iron.

Question 2

A Choose the correct answer :

1. The number of energy levels in the heaviest atom is ....
   a. 8   b. 7   c. 32   d. 18
2. Distance among molecules are very small in ....
   a. water.   b. copper.   c. hydrogen.   d. oil.
3. An object of 20 N weight and it is placed at a height of 5 m, so its potential energy is .... joule.
   a. 50   b. 150   c. 100   d. 200
4. .... is from the animals that make hibernation in winter.
   a. Frog   b. Jerboa   c. Desert snail   d. Sloth

B What happen if ... ?

1. Using water in putting out petrol fires.
2. The electron gains a quantum of energy.
3. If the front limbs of the bat are not modified into wings.
4. The front teeth of hedgehog are not extending outwards.

C From the opposite figure answer the following questions :

1. Mention the name of the opposite device.
2. Label the fig.
3. Mention the idea of operation.

Question 3

A Write the scientific term :

1. Number of positive protons in nucleus of the atom.
2. The plants which devour insects to get protein.
3. The way of transferring the heat through solids.
4. An alloy which is used in making heating coils.

B Correct the underlined words :

1. The networks of cellular phone cause <u>noise</u> pollution.
2. Work = force × <u>time</u>.
3. <u>Gold</u> is very active metal.
4. <u>Boiling</u> point is the temperature at which matter changes from solid into liquid state.

C Your classmate has seen a bird, he doesn't know this bird's name but he managed to :

Describe it as a bird with a sharp beak and the legs end in fingers with strong claws. According to your classmate story, answer the following questions :

1. What is the type of adaptation in both the beak and leg of this bird ?
2. How many fingers are in each leg ?
3. What type of food does this bird feed on ?

Question 4

A Give one difference between each of the following :

1. Beans and wheat.
2. Neutron and proton.
3. Element and compound.
4. Mechanical energy and heat energy.

B Give one example showing each of the following :

1. Micro-organisms.
2. A solution that is good conductor of electricity.
3. Alloy used in making the jewelry industry.
4. Soft material at normal temperature.

C Give reasons for :

1. Some animals undergo hibernation.
2. Camel's legs end with broad pad.

20 Minia Governorate

St. Mark Schools

Answer the following questions :

Question 1

A Choose the correct answer :

1. The attraction force is very weak in ....
   a. iron. b. milk. c. oxygen. d. oil.
2. Chemical energy can be stored in ....
   a. radio. b. car battery. c. car lamp. d. piano.
3. The fourth energy level in calcium $_{20}Ca$ is filled with .... electrons.
   a. 7 b. 8 c. 2 d. 5
4. An object of mass 4 kg is moving at a speed of 8 m/sec has a kinetic energy equal .... joule.
   a. 120 b. 128 c. 130 d. 190
5. The plant that reproduces by spores is ....
   a. pine. b. bean. c. vougheir. d. maize.
6. All of following solutions conduct electricity except .... solutions.
   a. salt b. acidic c. alkaline d. sugary

B Write the symbol of the following :

1. Sulphur.
2. Iron.
3. Sodium.
4. Aluminium.

C **Give reasons for the following :**

1. The atom is electrically neutral.
2. A piece of wood floats on water surface.
3. Hedgehogs have front teeth extending outwards.
4. The freezer is found at the top of the fridge.

Question 2

A **Write the scientific term of each of the following :**

1. The product results from combination of atoms of different elements with constant weight ratios.
2. The sum of numbers of protons and neutrons in the nucleus of an atom.
3. The way by which the heat is transferred through copper or metallic wires.
4. The behaviour that some animals do by hiding in humid burrows to avoid the extreme rise in temperature in summer.
5. It is the ability to do work or to make a change.
6. The branch of biology that searches for similarities and differences among living organisms.

B **Write the electronic configuration of the following :**

1. $^{23}_{11}Na$
2. $^{40}_{18}Ar$
3. $^{14}_{7}N$
4. $^{7}_{3}Li$

C **Mention one difference between :**

1. Insects and arachnids.
2. Rodents and lagomorphs.

Question 3

A **Give an example for each of the following :**

1. An alloy that is used in making jewels.
2. A very active metal.
3. A liquid element composed of one atom.
4. An animal which doesn't have any support.
5. Hibernation in amphibian.
6. A micro-organism.

B **Mention the changes of energy in the following :**

1. Solar cell.
2. Electric heater.
3. Simple electric cell.
4. Radio cassette.
5. Dynamo.

Question 4

A **Complete the following statements :**

1. Matter is composed of small building units called .... , while these units are composed of smaller units called ....
2. Noble gases have eight electrons in the outermost energy level except .... which has .... electrons.

3. Heat is transferred through gases by .... and ....

4. .... and .... belong to teethless mammals.

B Problem :

When a piece of red copper of mass 44 gm. is put in a graduated cylinder containing 100 cm^3 of water, the reading of the cylinder becomes 105 cm^3 calculate the density of red copper.

C Choose the odd word out, then write scientific term of the others :

1. Ice – Wood – Iron – Cork.
2. Dieonia – Drosera – Elodea – Halophila.
3. Bean – Corn – Pine – Wheat.
4. Lion – Tiger – Sloth – Wolf.

21 Sohag Governorate — El-Manahel Private Language School

Answer the following questions :

Question 1

A Complete the following sentences :

1. Some solutions are good conductors of electricity such as .... while some solutions are bad conductors of electricity such as ....
2. The liquid element whose molecule is composed of one atom is .... while the liquid element whose molecule is composed of two atoms is ....
3. Heat transfer by radiation takes place through .... medium and .... medium.
4. The legs of the horse end in .... to help it run on rocky soil while the legs of the camel end in .... to help it walk on sand.
5. The energy level "K" is saturated with .... electrons while energy level "N" is saturated with .... electrons.

B Give reasons for :

1. The motion of the children's swing is like that of the pendulum.
2. Metallic spare parts of cars are covered with grease.

C Calculate the density of a piece of metal its mass is 78 gm and its volume is 10 cm^3.

Question 2

A Choose the correct answer :

1. .... is from substances that float on the surface of the water.
   a. Iron b. Cork c. Copper d. Aluminium
2. The symbol of chlorine atom is ${}^{35}_{17}Cl$ then the number of neutrons equals ....
   a. 18 b. 35 c. 17 d. 7

3. The potential energy of an object equals zero ....
   a. on reaching the ground. b. when it reaches the maximum height.
   c. when its velocity increases. d. when its velocity decreases.
4. The electric energy change into kinetic energy in ....
   a. electric lamp. b. cell phone. c. electric fan. d. electric bell.
5. .... from gymnosperms.
   a. Wheat b. Maize c. Vougheir d. Pine
6. The front teeth extend outward in ....
   a. hedgehog. b. sloth. c. tiger. d. rabbit.

B Mention one importance (use) of each of the following :

1. Nickel-chrome alloy. 2. Sharp beaks in predators.
3. Paddles in whale. 4. Solar cells.

C Compare between :

1. Oxygen molecule and neon molecule (according to : the number of atoms).
2. Mosquito and scorpion (according to : the number of legs).

Question 3

A Write the scientific term :

1. Element that reacts instantly with oxygen when expose to humid air.
2. A molecule of a compound composed of two hydrogen atoms and an oxygen atom.
3. The result of multiplying displacement × force.
4. It is a form of energy which transfers from a higher temperature object to a lower temperature object.
5. It is the behaviour through which animals stop their most vital activity to avoid the extreme rise in temperature in summer.

B Mention one example of each of the following :

1. A substance with a low melting point. 2. Insectivorous plant.
3. A renewable source of energy. 4. Camouflage in insects.

C A stone of 5 kg in mass falls from a height of 8 m. calculate the potential and kinetic energies at the start of falling. (acceleration due gravity is 10 m/s^2)

Question 4

A Put (✓) or (✗) :

1. The intermolecular forces between solid molecules is non existent. ( )
2. The rule ($2n^2$) is not applied on the energy level "M". ( )
3. Secretion of poison in snakes is behavioural adaptation. ( )

4. Amoeba is from micro-organisms. ( )
5. The solid molecules vibrate in a simple vibratory motion. ( )
6. The temperature of bodies increases by increasing their speed. ( )

B What is meant by ... ?

1. Element.
2. The conservation law of energy.

C Write the electronic configuration of :

1. $_3Li$
2. $_7N$
3. $_{18}Ar$
4. $_{20}Ca$

22 Qena Governorate

Science Inspectorate

Answer the following questions :

Question 1

A Complete the following sentences :

1. The melting point is the temperature at which matter begins to change from a .... state to a .... state.
2. Hydrogen molecule is composed of .... atom(s), while argon molecule is composed of .... atom(s).
3. Potential energy increases by increasing the .... of the body and its .... from the ground.
4. The whale front limbs are modified into .... to take the role of ....

B Complete the following table :

	Number of neutrons	Electronic configuration
$^{7}_{3}Li$	.... (1)	.... (2) ....
$^{24}_{12}Mg$	.... (3)	.... (4) ....

C What is meant by ... ? Heat energy.

Question 2

A Write the scientific term :

1. The result of combination between two or more atoms of different elements with constant weight ratios.
2. The number of positive protons in the nucleus of atom.
3. The way by which heat is transferred from the Sun to the Earth.
4. The behaviour that some animals do by hiding in burrows to avoid the low temperature in winter.

B **Cross out the odd word then write scientific term for the other words :**

1. Lion – Dogs – Tiger – Armadillo.
2. Sugar solution – Acidic solution – Salt solution – Alkaline solution.
3. Oxygen – Ammonia – Bromine – Carbon.
4. Dieonea – Drosera – Amoeba – Halophila.

C **Someone kicked a ball of mass 0.5 kg and weight is 5 newton vertically upward at a height of 4 m, its speed was 10 m/sec, calculate the potential energy and the kinetic energy at 4 m height.**

Question 3

A **Choose the correct answer :**

1. The attraction force among solid molecules are ....
   a. strong. b. weak. c. moderate. d. almost not found.
2. Electric energy is converted into kinetic energy in ....
   a. electric lamp. b. electric fan. c. electric bell. d. electric heater.
3. .... is an example of plants that reproduce by spores.
   a. Wheat b. Vougheir c. Pine d. Maize
4. .... bird migrates in the winter.
   a. Quail b. Hawk c. Duck d. Eagle

B **Correct the underlined words :**

1. The energy level **"K"** has the highest energy in the atom.
2. Insectivorous plants cannot absorb the nitrogenous substances that make **fats**.
3. Mercury is **diatomic** element.
4. Heat transfers through liquids by **conduction**.

C **Give a reason for the following :**

A piece of wood floats on water surface while a piece of lead sinks in it.

Question 4

A **Put (✓) in front of the right statement and (✗) in front of the wrong ones :**

1. Cold air rises up, while hot air falls down. ( )
2. Ducks and geese have palm legs to help them in swimming. ( )
3. Molecules of same substance are different from each other. ( )
4. Human belongs to one species although he differs in color or race or home. ( )

B **Write the chemical symbols of the following :**

1. Sodium. 2. Iron. 3. Sulphur. 4. Silver.

C **Compare between insects and arachnids,** (According to the number of legs).

23 Aswan Governorate — ALMostaqbal Language School

Answer the following questions :

Question 1

A Complete the following statements :

1. An alloy of .... is used in making jewels while an alloy of .... is used in making heaters coils.
2. The liquid element whose molecule is composed of one atom is .... while that composed of two atoms is ....
3. Some plants have large-sized leaves such as .... and some has small-sized leaves such as ....
4. .... and .... are examples for insectivorous.

B Mention the change of energy in the following :

Technological applications	Change of energy	
	from	to
1. Electric fan		
2. Electric lamp		
3. Electric bell		
4. Solar heater		

C Problem :

Find the weight of an object of potential energy 88 joule when found at a height 11 m.

Question 2

A Choose the correct answer :

1. .... are from the animals which don't have a body support.
   a. Reptiles b. Snails c. Jellyfish d. Cartilaginous fish
2. Heat is transferred through solids by ....
   a. conduction and convection. b. radiation only.
   c. radiation and convection. d. conduction only.
3. As an object falls downwards ....
   a. the potential energy increases. b. the kinetic energy increases.
   c. the mechanical energy is lost. d. the speed of the object decreases.
4. The taste property is a distinguishing factor between ....
   a. milk and honey. b. wood and plastic.
   c. silver and gold. d. perfume and vinegar.

B Write the symbols of the following elements :

1. Sodium. 2. Nitrogen. 3. Aluminium. 4. Phosphorus.

C Give a reason for :

When adding an amount of table salt to water, it disappears after a time.

Question 3

A Write the scientific term of each of the following :

1. The product resulted from combination of atoms of different elements with constant weight ratios.
2. Energy needed or lost to transfer an electron from an energy level to another.
3. A form of energy which is transferred from the object of higher temperature to that of lower temperature.
4. The temperature at which a substance changes from the liquid state to the gaseous state.

B Write the electronic configuration of the following elements :

1. $^{4}_{2}He$ 2. $^{24}_{12}Mg$ 3. $^{40}_{18}Ar$ 4. $^{32}_{16}S$

C What do you expect in each of the following cases ... ?

The beaks of a hoopoe and a hawk are mutually exchanged.

Question 4

A Put (✓) or (✗) in front of the following sentences :

1. Molecules of the same substance are different from each other. ( )
2. The molecules of solid substances vibrate in a simple vibratory motion. ( )
3. Cool air rises up, but hot air falls down. ( )
4. The motion of gaseous molecules is limited. ( )

B State one difference between each of the following :

1. A rabbit and a squirrel. 2. Beans plant and wheat plant.

C What is meant by the following ... ?

Mechanical energy of an object is 100 joule.

24 South Sinai Governorate

El-Tur Directorate

Answer the following questions :

Question 1

A Write scientific term :

1. The smallest part of matter which can exist freely.
2. Plants can't be distinguished into roots, stems and leaves.

3. Metals used for painting iron to protect it from rusting.
4. Energy is neither created nor destroyed, but it is converted from one form to another.

B Give an example of each the following :

1. A compound molecule that consists of two atoms.
2. Mammal animal have teeth extending outwards.
3. Permanent resource of energy.
4. Functional adaptation.

C An atom of element have number of electrons in the third level equal the number of electrons that have in the first energy level :

1. Write the electronic configuration.
2. Determine its atomic number.

Question 2

A Complete the following :

1. The symbol of mercury .... , while (Au) is the symbol of ....
2. The electric current in the simple electric cell transfers from .... plate to .... plate
3. The number of atoms in bromine molecule is .... while the number of atoms in water molecule is ....
4. .... and .... are examples of insects adapted by camouflage.

B Compare between :

1. **Rodents and lagomorphs** (according to the number of teeth – examples).
2. **Solid objects and gaseous objects** (according to the way of heat transfer – the motion of molecules).

C A metallic ball has mass 3 kg. was thrown up to reach height 7 meter, calculate the potential energy of the ball at maximum height. "the acceleration due to gravity = 10 m/sec^2".

Question 3

A Correct the underlined words :

1. Heat transfers by **conduction** doesn't need for a material medium.
2. **Mass** is the ability to do work.
3. Horse limbs end by **sharp claws** to help the horse run on the rocky soil.
4. From solutions that are bad conductor of electricity **table salt** solution.

B Mention one importance for each of the following :

1. Nickel-chrome alloy.
2. Palm legs of ducks.
3. Solar cells.
4. Hibernation.

C What is meant by ... ?

1. The density of Iron = 7.8 gm/cm^3
2. The kinetic energy of a body = 90 joule.

Question 4

A What happens when ... ?

1. The atom gains a quantum of energy.
2. The beak of hawks and vulture are long and thin.
3. Putting the electric heater on the ground.
4. Using of water in putting out petrol fires.

B Choose the correct answer :

1. .... is from gymnospmers plants.
   a. Bean b. Pine c. Pea d. Maize
2. Electromagnetic pollution is resulted from ....
   a. the network of cellular phone. b. drilling machines.
   c. pesticides. d. the explosions.
3. Scientist who used the species as a fundamental unit of natural classifying system is ....
   a. Newton. b. Planck. c. Linnaeus. d. Einstein.
4. Putting of nut fastener its temperature 90°C in a cup of water its temperature 30°C, the temperature of water becomes ....
   a. 90°C. b. 120°C. c. 50°C. d. 30°C.

C Write the mathematical relationship used to calculate the following :

1. The work.
2. The number of neutrons in the nucleus.

25 New Valley Governorate — El-Kharga Directorate

Answer the following questions :

Question 1

A Complete the following statements :

1. The liquid element its molecule is composed of one atom is .... , while that is composed of two atoms is ....
2. On the Earth's surface, potential energy of a moving object equals .... while its kinetic energy equals the .... energy.
3. The networks of wireless transmitters of cellular phone cause .... pollution, but car exhaust cause .... pollution.
4. Heat transfer from liquids by .... , while through space by ....
5. .... is from the plants that reproduce by formation of spores, while .... is from the plants that reproduce by formation of seeds inside cone.

B **Mention one use or function :**

1. Nickel-chrome alloy.
2. The sharp and crooked beaks in hawk.

C **A ball was launched upward and vertically at speed 3 m/sec up to a height 4 m, calculate the mechanical energy of the ball if its weight is 5 newton and has a mass of 0.5 kg.**

Question 2

A **Choose the correct answer :**

1. A piece of lead of mass 114 gm occupies 10 cm^3, its density is .... gm/cm^3.
   a. 14 b. 124 c. 11.4 d. 1
2. A substance is solid and can't be soften by heating ....
   a. copper. b. wood. c. aluminium. d. iron.
3. An element has 2 electrons in the (M) level, so its atomic number is ....
   a. 8 b. 10 c. 12 d. 14
4. Secreting sweat by skin is considered .... adaptation.
   a. structural b. functional c. behavioural d. anatomical
5. From animals with internal support is ....
   a. octopus. b. fish. c. snail. d. jellyfish.
6. Chemical energy can be stored in ....
   a. car lamp. b. car battery. c. stretched spring. d. pendulum.
7. Scorpion belongs to ....
   a. insects. b. arachnids. c. myriapods. d. mammals.
8. In solar heater, solar energy is converted into .... energy.
   a. light b. electric c. heat d. sound

B **Give a reason for :**

Water isn't used to put out petrol fires.

C **Write the symbol of each of the following :**

1. Silver.
2. Chlorine.
3. Lead.
4. Sodium.

Question 3

A **Write the scientific term :**

1. The branch of biology that searches for the similarities and differences among living organisms.
2. A fundamental building unit of matter which can share in the chemical reaction.
3. It is the amount of energy lost or gained by an electron when it transfers from one energy level to another.
4. The way of transferring heat through solids.

5. The plants which devour insects to get protein.
6. The work done during the motion of an object.
7. It is a form of energy which transfers from a higher temperature object to lower temperature object.
8. The gases that don't take part in the chemical reaction.

B **What happens when ... ?**

Iron nail moisten by water is exposed to air for several days.

C **Mention one example :**

1. A teethless animal.
2. A permanent source of energy.

Question 4

A **What is meant by ... ?**

1. Law of energy conservation.
2. Camouflage.

B **Mention one difference between :**

1. Water molecule	**Nitrogen molecule**
....	....
2. Squirrel	**Rabbit**
....	....
3. Intermolecular force in solids	**Intermolecular force in gases**
....	....

C **Write the electronic configuration of :**

1. $^{24}_{12}Mg$
2. $^{20}_{10}Ne$

Then determine each of the following :

1. Number of neutrons.
2. Chemical activity.

	1. $^{24}_{12}Mg$	**2. $^{20}_{10}Ne$**
1. Number of neutrons :		
2. Chemical activity :		

SCIENCE

GUIDE ANSWERS

2023

BY A GROUP OF SUPERVISORS

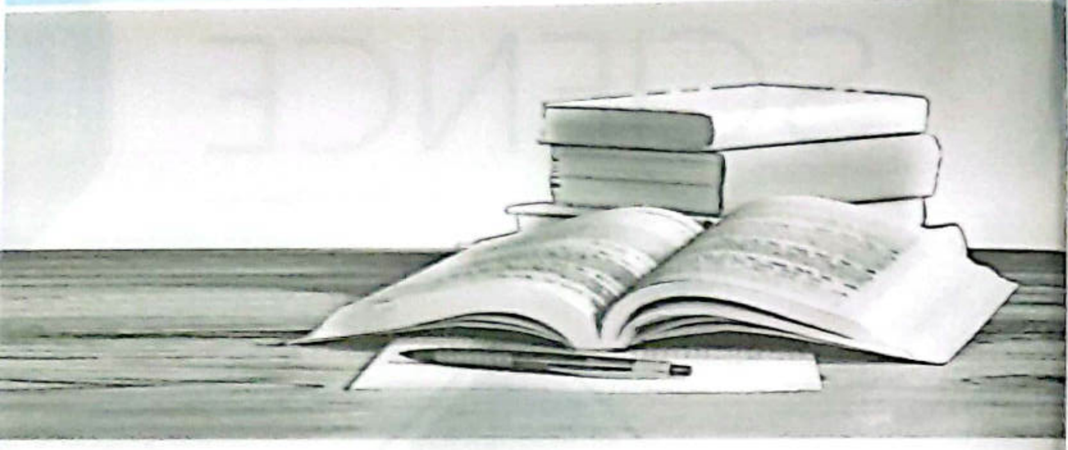
FIRST TERM

EL-MOASSER SERIES

1st prep.

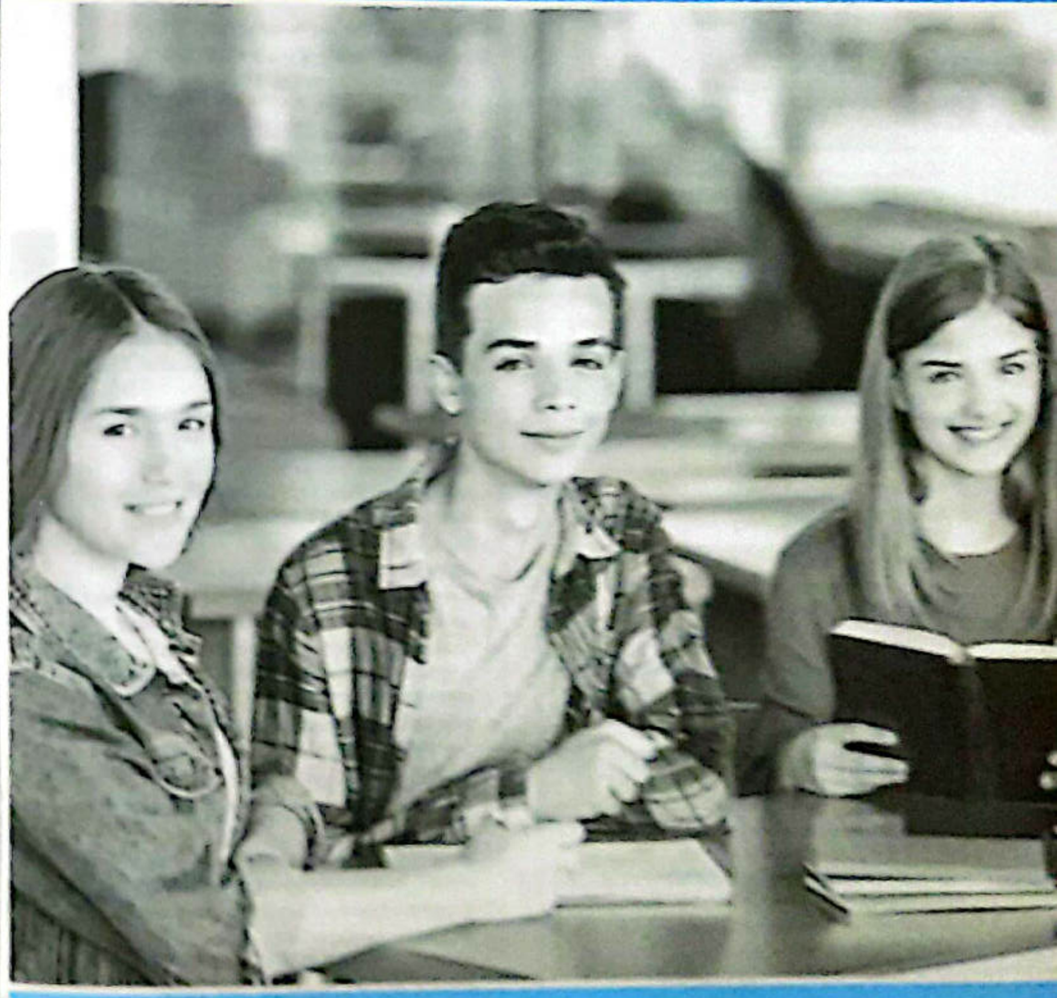


Contents



PART 1

Guide Answers of The Main Book



Unit One

Lesson 1

1

1. b	2. a	3. b	4. b	5. b
6. a	7. a	8. d	9. b	10. a
11. b	12. a	13. c	14. c	15. b
16. c	17. a	18. c	19. d	20. c
21. b	22. b	23. a	24. c	25. c
26. d	27. c	28. d	29. d	30. a

2 1. d. B 2. e. C 3. a. D 4. b. A

3 1. (✓) 2. (✓) 3. (✗) Density = $\frac{\text{Mass}}{\text{Volume}}$
4. (✓) 5. (✗) .... gm/cm^3 6. (✓)
7. (✗) .... lower density than that of water.
8. (✗) .... different volumes.
9. (✗) .... is less than ....
10. (✓) 11. (✓) 12. (✓)
13. (✗) .... as it has a high melting point.
14. (✗) .... is less than ....
15. (✓) 16. (✓)
17. (✗) .... is hard, ... rubber is soft ....
18. (✓) 19. (✓) 20. (✗) When iron ....
21. (✗) .... to humid air. 22. (✓)

4 1. Matter. 2. Density. 3. Mass.
4. Volume. 5. gm/cm^3.
6. Melting point. 7. Boiling point.
8. Very active metals.
9. Less active metals.
10. Inactive metals.

5 1. a mass – a volume. 2. colour
3. taste. 4. its mass – its volume.
5. gram – cubic centimetre
6. mass – gm/cm^3
7. density. 8. 11.4 gm/cm^3
9. Iron nail – metallic coin – higher
10. solid – liquid 11. Boiling point
12. Wax – ice – iron – copper
13. copper-gold – nickel-chrome
14. Rubber – coal – sulphur
15. Copper – iron – wood – plastic
16. acidic solution – alkaline solution – sugary solution
17. copper – aluminium – good
18. steel iron – plastic – wood.
19. Iron – copper
20. metallic luster – humid
21. Sodium – potassium – silver – gold
22. rusting.

6 1. Because air has a mass and occupies a certain space.
2. Because both of water and oxygen are colourless, tasteless and odourless.
3. Because the density of iron is more than that of wood.
4. Due to the difference in density.
5. Because the density of wood is less than that of water, while the density of lead is more than that of water.
6. Because the density of iron is more than that of water, while the density of cork is less than that of water.
7. Because the density of ice is less than that of water.
8. Because the density of petrol oil is less than that of water, so petrol floats on water surface and water doesn't put out the petrol fires.
9. Because the densities of hydrogen and helium are less than that of air.
10. Because its melting point is low.
11. To be easy for mixing and shaping to form alloys as copper-gold alloy.
12. Because metals become soft by heating, so it's easy to shape them, while coal doesn't become soft by heating, so it's difficult to shape it.
13. Because the hardness of iron is more than that of copper.
14. Because they are good conductors of electricity ,while plastic is a bad conductor of electricity.
15. Because steel iron is very hard and a good conductor of electricity, while plastic is a bad conductor of electricity.
16. Because they are good conductors of heat and they have high melting point.
17. Because each of them is bad conductor of heat.
18. Because they react easily with atmospheric oxygen.
19. To prevent their reaction with atmospheric oxygen, because they are active metals.
20. To protect them from rust and corrosion.
21. To remove the rust layer formed on their surfaces.
22. Because they are chemically poor active.

7 1. Hydrogen or helium. 2. Wax.
3. Iron. 4. Copper-gold alloy.
5. Nickel-chrome alloy. 6. Stainless steel alloy.
7. Rubber. 8. Coal.
9. Hydrogen chloride 10. Sulphur.
11. Aluminium. 12. Wood or plastic.
13. Sodium. 14. Potassium
15. Silver or gold. 16. Grease.

8 1. It is anything that has a mass and a volume.
2. It is the space that is occupied by the body.
3. It is the amount of matter that the body contains.
4. This means that the amount of matter in this object equals 4 gm.
5. This means that the density of aluminium is 2.7 gm/cm^3.
6. This means that the density of water is 1 gm/cm^3.
7. It is the mass of unit volume of a substance.
8. This means that the mass of 1 cm^3 of iron is 7.8 gm.
9. This means that the mass of 1 cm^3 of water equals 1 gm.
10. This means that the mass of 1 cm^3 of aluminium is 2.7 gm.
11. It is the temperature at which a substance begins to change from the solid state to the liquid state.
12. This means that the ice begins to change into water at 0°C.
13. It is the temperature at which a substance begins to change from the liquid state to the gaseous state.
14. This means that the water begins to change into water vapour at 100°C.

9 **Answer by yourself.**

10 1. It is used to fill celebrations balloons.
2. It is used in making jewels.
3. It is used in the manufacture of cooking pans.
4. It is used in making heating coils.
5. It is used in making electric wires or cables.
6. They are used in making the handles of cooking pans.
7. It is used to cover the substances which rapidly gain rust to protect them from corrosion.

11 1. The density remains constant.
2. The piece of cork floats on water surface, while the metallic coin sinks in it.
3. The petrol floats on water surface, so the fires don't put out.
4. It can't be soften by heating.
5. It rusts due to its reaction with atmospheric oxygen.
6. They will be rusted and corroded.
7. Their luster disappears due to their reaction with atmospheric oxygen.

12

The odd word	The scientific term
1. Force	– Density = $\frac{\text{Mass}}{\text{Volume}}$
2. Iron	– Substances float on water surface
3. Aluminium	– Substances have low melting points
4. Wood	– Good conductors of electricity
5. Potassium	– Inactive metals
6. Aluminium	– Bad conductors of electricity
7. Sugary solution	– Good conductors of electricity

13 1.

Sugary solution	Alkaline solution
It is a bad conductor of electricity.	It is a good conductor of electricity.

2.

P.O.C.	Iron	Sulphur
Hardness :	It becomes soft by heating to be shaped easily.	It can't be soften by heating.
Electric conduction :	It is a good conductor of electricity.	It is a bad conductor of electricity.

3.

P.O.C.	Copper	Plastic
Electric conduction :	Good conductor of electricity	Bad conductor of electricity
Thermal conduction :	Good conductor of heat.	Bad conductor of heat.

4.

Sodium	Nickel
It is active metal.	It is inactive metal.

5. *Look at the main book at pages (26, 27).*

14 1. Density = $\frac{\text{Mass}}{\text{Volume}}$ = [illegible] = 7.8 gm/cm^3
2. Mass = 0.5 × 1000 = 500 gm.
Volume = $\frac{\text{Mass}}{\text{Density}} = \frac{500}{8.8}$ = 56.8 cm^3

3. Volume = $\frac{Mass}{Density} = \frac{80}{0.8} = 100\ cm^3$

4. Mass = Density × Volume
$= 2.1 \times 5 = 10.5$ gm.

5. The volume of the iron = The volume of water and a piece of iron – The volume of water
$= 110 - 100 = 10\ cm^3$
The density of iron = $\frac{Mass}{Volume} = \frac{78}{10}$
$= 7.8\ gm/cm^3$

6. The mass of water = The mass of the cylinder containing water – The mass of the empty cylinder
$= 165 - 65 = 100$ gm.
The density of water = $\frac{Mass}{Volume} = \frac{100}{100}$
$= 1\ gm/cm^3$

7. The volume of the rock = The volume of water and the piece of rock – The volume of water
$= 100 - 80 = 20\ cm^3$
Density of rock = $\frac{Mass}{Volume}$
$= \frac{50}{20} = 2.5\ gm/cm^3$

8. Volume of marble $= 60 - 40 = 20\ cm^3$
Density of marble = $\frac{Mass}{Volume} = \frac{100}{20} = 5\ gm/cm^3$

9. Volume of the piece of aluminium
$= \frac{Mass}{Density} = \frac{27}{2.7} = 10\ cm^3$
∴ Water rises $= 100 + 10 = 110\ cm^3$
– Water rises to $110\ cm^3$ in the cylinder.

10. ∵ The two balls have the same metal.
∴ The two balls have the same density.
∵ The density of first ball = $\frac{78}{10} = 7.8\ gm/cm^3$
∴ The mass of the second ball
$= D \times V = 7.8 \times 20 = 156$ gm.

11. a. Volume of the stone = Volume of water and the stone – Volume of water
$= 30 - 20 = 10\ cm^3$
b. Density of the stone = $\frac{Mass}{Volume} = \frac{80}{10}$
$= 8\ gm/cm^3$
c. The stone floats, because its density is less than that of mercury.

[illegible] (1) Density = $\frac{Mass}{Volume}$

(2) (1) $8\ gm/cm^3$ (2) $2\ gm/cm^3$
(3) $0.5\ gm/cm^3$ (4) $0.5\ gm/cm^3$
1. A 2. C & D

(3) – He can measure its volume and its mass.
– Calculate its density = $\frac{Mass}{Volume}$
– If the density is less or more than the density of silver, the medal is fake.

(4) – Wood and ice float on water surface, because their densities are less than $1\ gm/cm^3$ (density of water).
– Iron and glass sink in water, because their densities are more than $1\ gm/cm^3$ (density of water).

(5) – Determine its mass by using a balance.
– Determine its volume by using a graduated cylinder.
– Determine its density = $\frac{Mass}{Volume}$
• If the density equals $1.03\ gm/cm^3$, the milk is pure.
• If the density is more or less than $1.03\ gm/cm^3$, the milk is impure.

(6) • Sodium & Potassium : Very active metals.
• Gold – Platinum – Nickel & Chromium : Inactive metals.
• Aluminium – Iron & Copper : Less active metals.

(7) In fig. (A), because alkaline solution is a good conductor of electricity.

(8) The egg is rotten, so it floats on water surface, where its density is less than that of water.

(9) a. (3) < (1) < (2) < (4).
b. (4) < (2) < (1) < (3).

(10) Cube (2) < Cube (3) < Cube (1).

(11) 1. Because iron nail and aluminium holder are good conductors of heat.
2. The piece of wax melts, because the melting point of wax is low.

(12) c

(13) 1. The substance (X) is a good conductor of electricity.
2. a. The lamp doesn't illuminate, because the wood is a bad conductor of electricity.
b. The lamp illuminates, because the dil. hydrochloric acid solution is a good conductor of electricity.

Thinking Skills Questions

1 1. c 2. c 3. b

---

2 a

---

3 1. a. The volume of cube $= 2 \times 2 \times 2 = 8\ cm^3$
$D = \frac{M}{V} = \frac{6}{8} = 0.75\ gm/cm^3$
b. The cube floats on water surface, because the density of wood is less than that of water.

2. – The mass of $10\ cm^3$ of the Earth's surface
$= D \times V = 3 \times 10 = 30$ gm.
– The mass of $10\ cm^3$ of Moon's surface
$= D \times V = 2.5 \times 10 = 25$ gm.
∴ The mass of $10\ cm^3$ of the Earth's surface is more than the mass of $10\ cm^3$ of Moon's surface.

3. – Mass of helium $= D \times V = 0.00017 \times 1000$
$= 0.17$ gm.
– Mass of balloon full of helium $= 0.5 + 0.17$
$= 0.67$ gm.

---

4 (1) Y > Z > X (2) Sodium & Potassium.
(3) a. Z b. X

---

5 c

Lesson 2

1

1. b	2. a	3. b	4. a	5. c	6. b
7. a	8. a	9. d	10. a	11. b	12. a
13. a	14. b	15. a	16. b	17. c	18. b
19. c	20. c	21. c	22. d	23. b	24. c
25. c	26. c	27. c	28. b	29. a	

---

2 1. (✓) 2. (✓) 3. (✗) ...... unlimited.
4. (✗) ...... less than $200\ cm^3$
5. (✓) 6. (✗) ...... are very strong.
7. (✗) Solids ......
8. (✗) Solid matter ......
9. (✗) ...... gain energy. 10. (✓)
11. (✗) ...... similar to each other
12. (✗) ...... similar 13. (✓)
14. (✗) The molecules of active gases are formed of two atoms, while the molecules of inert gases are formed of one atom.
15. (✓) 16. (✓)
17. (✗) ...... liquid ......
18. (✗) ...... atoms of two or more different elements.
19. (✗) ...... three atoms of two elements.
20. (✗) ...... one nitrogen atom and ......

---

3 1. The molecule.
2. Intermolecular spaces.
3. Intermolecular forces. 4. Melting process.
5. Vaporization process. 6. The atom.
7. The element. 8. Nobel gases.
9. Active gases. 10. Mercury.
11. Bromine. 12. The compound.
13. Water molecule.
14. Hydrogen chloride molecule.
15. Ammonia molecule.

---

4 1. Molecule – cell
2. very small – very large
3. vanishing (very weak). 4. Liquids – gas
5. attraction forces – spaces
6. speed – intermolecular spaces
7. gain – liquid 8. gain – gaseous
9. molecules – atoms
10. alike (similar) – differ
11. nobel – one
12. mercury – bromine. 13. two – one
14. two – one 15. two – one
16. two hydrogen – one oxygen
17. one hydrogen – one chlorine

---

5 1. (1) Limited (2) Intermediate (more free)
(3) Very small (4) Very large
(5) Intermediate (relatively weak)
(6) Very weak (7) Definite
(8) Indefinite (9) Indefinite
(10) Definite (11) Indefinite
2. *Look at the main book on pages (52 , 53).*

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6 *Look at the main book on page (51).*

---

7 1. Because the molecules of the perfume are in a continuous motion and they keep the properties of the perfume.
2. Because the molecules of ink or potassium permanganate are in a continuous motion in all directions among water molecules.

3. Because when the table salt dissolves in water, the molecules of table salt or sugar spread in the intermolecular spaces among water molecules.
4. Because some molecules of alcohol occupy the intermolecular spaces among water molecules.
5. Because there are strong attraction forces among iron molecules.
6. Because there are weak attraction forces among water molecules.
7. Because in solid substances the intermolecular spaces among their molecules are very narrow and the intermolecular force is very strong, so the molecules are relativity fixed in their positions, while in liquid the intermolecular spaces among its molecules are relativity large and the intermolecular force among its molecules is weak, so it takes the shape of its container.
8. Because they are characterized by large intermolecular spaces and very weak intermolecular forces, therefore the molecules are relatively free.
9. Because by heating, solid molecules gain thermal energy, so their speed increases and at the melting point, the intermolecular forces weaken, so the intermolecular spaces increase and they become more freely leading to the change of matter from the solid state into the liquid state.
10. Because when a liquid substance is heated, its molecules gain more energy and their speed increases and at the boiling point, the molecules overcome the intermolecular forces and the intermolecular spaces increase, so they escape in the form of vapour.
11. Because molecule of an element consists of similar atoms, but molecule of a compound consists of different atoms.
12. Because oxygen molecule consists of two similar atoms, while hydrogen chloride molecule is composed of two different atoms.
13. Because helium is an inert gas and its molecule is monoatomic, while hydrogen is an active gas and its molecule is diatomic.
14. Because molecules of various substances differ from each other in :
   - number of atoms.
   - kind of atoms.
   - way of combination between atoms.

8 1. Iron. 2. Water. 3. Oxygen gas.
4. Mercury. 5. Bromine.
6. Oxygen. 7. Argon.
8. Water molecule. 9. Ammonia molecule.
10. Hydrogen chloride.

9 1. It is the smallest part of matter which can exist freely and it has the properties of matter.
2. It is the change of matter from the solid state to the liquid state by heating.
3. It is the change of matter from the liquid state to the gaseous state by heating.
4. It is the simplest pure form of matter which can't be analyzed chemically into simpler form by simple chemical methods.
5. It is a substance which is formed from combination of atoms of two or more different elements with constant weight ratios.

10 1. The odour of the perfume spreads all over the room.
2. The colour of ink spreads through all the water.
3. Table salt will dissolve in water as the table salt molecules spreed in the intermolecular spaces among water molecules.
4. The volume of the mixture will be less than 150 cm^3.
5. You can't break the iron piece as the attraction force among its molecules is very strong.
6. Its molecules gain thermal energy, so their speed increases and at the melting point, the intermolecular forces weaken, so the intermolecular spaces increase and they become more freely leading to the change of matter from the solid state into the liquid state.
7. Its molecules gain thermal energy, so their speed increases and at the boiling point, the molecules overcome the intermolecular forces and the intermolecular spaces increase, so they escape in the form of vapour.
8. Ammonia molecule is formed.

11

The odd word	The scientific term
1. Water vapour	- Liquid matter.
2. Oxygen	- Inert gases.
3. Helium	- Elements molecules consist of two atoms.
4. Aluminium	- Compounds.
5. Water	- Elements.

12 *Look at the main book on page (46).*

13 1. *Look at the main book on page (49).*

2.

Point of comparison	Water	Ice
The intermolecular spaces :	Intermediate	Very small (narrow)

3.

P.O.C.	Iron	Oxygen
No. of atoms :	One atom.	Two atoms.
Electric conduction :	Good conductor of electricity	Bad conductor of electricity.
Intermolecular forces :	Very strong.	Very weak.
Intermolecular spaces :	Very small.	Very large.

4. *Look at the main book on page (53).*

5.

Chlorine molecule	Mercury molecule
- It is formed of two atoms.	- It is formed of one atom.
- It is a gaseous element.	- It is a liquid element.

6.

Water molecule	Ammonia molecule
It consists of two hydrogen atoms and one oxygen atom.	It consists of three hydrogen atoms and one nitrogen atom.

14 1. *Look at the main book on page (45).*
2. *Look at the main book on page (46).*
3. *Look at the main book on page (47).*

15 Because the molecules of the perfume are in a continuous motion and they keep the properties of perfume.

16 **(1)** **A.** 1. Fig. (B) 2. Fig. (C) 3. Fig. (A)
B. 1. melting process.
2. vaporization process.

(2) 1. Figure (2), because the intermolecular spaces are very small.
2. boiling – gaseous
3. **Answer by yourself.**
4. c. (3)

(3) – Fig. (1) & (4) represent element molecules, because each of them consists of two similar atoms.
– Fig. (2), (3) & (5) represent compound molecules, because each of them consists of different atoms.

Thinking Skills Questions

1 1. very small – very strong. 2. 1 : 1

2 1. (✓)
2. (✗) ...... the intermolecular forces decrease and the intermolecular spaces increase.

3 c

4

Compound	No. of atoms
- Water	3
- Hydrogen chloride	2
- Ammonia	4

5 c

6

P. O. C.	Active gases	Inert gases
- Their numbers :	5 elements.	6 elements.
- Their names :	Hydrogen, Nitrogen, Oxygen, Fluorine & Chlorine.	Helium, Neon, Argon, Krypton, Xenon & Radon.
- No. of atoms of the molecule :	Two atoms.	One atom.

7 b

8 1. Fig. (B) 2. Fig. (E) 3. Fig. (F)
4. Fig. (A) 5. Fig. (D) 6. Fig. (C)

9 1. Fig. (B), because ice melts and converts into water.
{It changes from solid state into liquid state}.
2. Fig. (A), because water boils and converts into water vapour.
{It changes from liquid state into gaseous state}.

Lesson 3

1

1. c	2. c	3. c	4. d
5. a	6. c	7. d	8. b
9. b	10. c	11. c	12. a
13. d	14. c	15. c	16. c
17. b	18. c	19. a	20. c
21. d	22. c	23. b	24. d
25. b	26. b	27. b	28. b
29. d	30. a	31. d	32. b
33. d			

2 1. d 2. e 3. f 4. c 5. a 6. b

3 1. (✗) .... of helium element, while .... of hydrogen element.
2. (✗) .... of carbon is (C).
3. (✗) Protons ....
4. (✗) .... sum of protons and neutrons ....
5. (✓) 6. (✓)
7. (✗) .... above the symbol ....
8. (✗) .... equals (7).
9. (✗) .... the lowest energy.
10. (✗) .... is more than ....
11. (✗) .... when it gains ....
12. (✗) .... ($2n^2$).
13. (✗) .... saturated with 2 electrons.
14. (✓) 15. (✗) .... 2 electrons.
16. (✓) 17. (✗) .... 2 electrons.
18. (✗) .... three energy levels.
19. (✗) .... of an inactive element ....
20. (✗) .... inactive elements.
21. (✓) 22. (✓)

4
1. The atom. 2. Protons.
3. Neutrons. 4. Atomic number.
5. Mass number. 6. Electrons.
7. Energy levels. 8. "Q" level.
9. "K" level. 10. Quantum.
11. Excited atom. 12. "M" level.
13. Nobel (inert) gases. 14. Active elements.
15. Helium.

5
1. (Na) – (S). 2. gold – silver
3. atom. 4. nucleus – electrons.
5. protons – neutrons
6. neutrons – protons. 7. atomic – mass
8. negative – positive

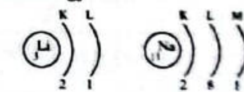
9. 17 – 17 10. Mass – Atomic
11. "L" – "N" 12. increases.
13. "Q" – "K" 14. gains – excited
15. gains – loses 16. $2n^2$ – four
17. 8 – 32 18. 13
19. 3 20. 7 – active
21. 4 – 8 22. 8 – inactive
23. helium – 2 24. less – stable

6

Element name	Chemical symbol	Atomic no.	Mass no.	No. of protons or No. of electrons	No. of neutrons	Electronic configuration K	L	M	N	Chemical activity
Calcium	${}^{40}_{20}Ca$	20	40	20	20	2	8	8	2	Active
Fluorine	${}^{19}_{9}F$	9	19	9	10	2	7	-	-	Active
Oxygen	${}^{16}_{8}O$	8	16	8	8	2	6	-	-	Active
Argon	${}^{40}_{18}Ar$	18	40	18	22	2	8	8	-	Inactive (inert gas)
Potassium	${}^{39}_{19}K$	19	39	19	20	2	8	8	1	Active
Neon	${}^{20}_{10}Ne$	10	20	10	10	2	8	-	-	Inactive (inert gas)
Magnesium	${}^{24}_{12}Mg$	12	24	12	12	2	8	2	-	Active

7
1. Because the name of each of them starts with letter (C) so, (C) is chosen as the symbol of carbon and (Ca) is the symbol of calcium.
2. Because the symbol is derived from Latin name, so that the symbol of some this element differs from its name in English language.
3. Because the number of negative electrons that revolve around the nucleus is equal to the number of positive protons in the nucleus.

4. Because the electron has a negligible mass relative to the mass of proton or neutron.
5. Because it contains protons which are positively charged and neutrons which are electrically neutral.
6. Because the mass number is the sum of numbers of protons and neutrons in the nucleus, while the atomic number is the number of protons only.
7. Because hydrogen atom doesn't contain neutrons, so the mass no. = The atomic no. = The no. of protons.
8. Because the energy of "K" level is less than that of "L" level.
9. Because the energy levels are saturated with electrons according to the rule ($2n^2$), so the number of electrons that saturate "M" level $= 2 \times (3)^2 = 18$ electrons.
10. Because the atom becomes unstable if the level contains more than 32 electrons.
11. Because if the outermost energy level contains 8 electrons, so the element is inactive (inert), while if the outermost energy level contains less than 8 electrons, so the element is active.
12. Because both of them have one electron in the outermost energy level.



13. Because both of them have three energy levels.
14. To produce stable molecules.
15. Because the outermost energy levels of their atoms are completely filled with electrons.
16. Because the outermost energy level of neon atom is saturated with 8 electrons.
17. Because the outermost energy level of nitrogen has 5 electrons and it tends to complete it to produce stable molecule.
18. Because the outermost energy level of sodium atom is not completely filled with electrons (contains one electron), while the outermost energy level of argon atom is completely filled with electrons (contains 8 electrons).

8
1. It is the fundamental building unit of matter.
2. It is the number of protons in the nucleus of an atom.
3. This means that the number of protons in the nucleus of lithium atom is (3).
4. It is the sum of the numbers of protons and neutrons in the nucleus of an atom.
5. This means that the sum of the numbers of protons and neutrons in the nucleus of oxygen atom is (16).
6. They are imaginary regions around the nucleus in which the electrons move according to their energies.
7. It is the amount of energy lost or gained by an electron when it transfers from one energy level to another.
8. It is the atom that gains a quantum of energy.

9
1. Its atomic number is equal to its mass number.
2. The value of the positive charge changes and the value of the atomic number and mass number change so, the element changes into another element.
3. It will transfer to a higher energy level and the atom will be excited atom.
4. The electron returns to its original energy level and the atom returns to its original (ground) state.
5. The atom will react chemically with another atom or more than one atom to produce a molecule in a stable state.

10

The odd word	The scientific term
1. Quantum.	- Components of atom.
2. ${}^{40}_{20}Ca$	- Elements which their electrons are distributed in 3 energy levels.
3. ${}_{12}Mg$	- Elements which their outermost energy level contains only one electron.
4. ${}_{18}Ar$	- Active elements.

11 1.

Atomic number	Mass number
- It is the no. of protons in the nucleus.	- It is the sum of the numbers of protons and neutrons in the nucleus.
- It is written below the symbol from the left side.	- It is written above the symbol from the left side.

2. *Look at the main book on page (70).*

3.

Points of comparison	Aluminium atom ($^{27}_{13}Al$)	Argon atom ($^{40}_{18}Ar$)
– No. of neutrons :	14	22
– No. of electrons in the outermost energy level :	3	8
– Chemical activity :	Active	Inactive (Inert gas)

4.

P.O.C.	The energy level (L)	The energy level (M)
– No. of level :	2	3
– No. of electrons which saturates the level :	8	18

5. *Look at the main book on page (75).*

12 1. Na 2. K 3. Cl 4. N 5. Ca
6. Al 7. P

13 1. Hydrogen. 2. Helium. 3. Gold.
4. Silver 5. Lead. 6. Sulphur.
7. Silicon. 8. Argon. 9. Iodine.
10. Copper. 11. Bromine. 12. Carbon.
13. Mercury. 14. Iron. 15. Oxygen.
16. Neon.

14 **Answer by yourself.**

15 1. Symbols used to express elements easily.
2. They are responsible for the chemical reactions.

16 (1) 1. ($2n^2$)
2. Mass no. = No. of protons + No. of neutrons.
3. No. of neutrons = Mass no. – Atomic no.

(2) Atomic no. = 6
Mass no. = 6 + 6 = 12

(3) – In ($^{24}_{12}Mg$) :
No. of protons = 12
No. of neutrons = 24 – 12 = 12
– In ($^{23}_{11}Na$) :
No. of protons = 11
No. of neutrons = 23 – 11 = 12
– By calculating the number of protons and neutrons in each atom, we find that the number of neutrons in the two atoms is the same

(12), so the difference between them in the atomic number and mass number is due to the difference in the number of protons.

(4) K L M
2 8 1

(5) 1. 20 2. 20 3. 20 4. 8

(6) 1.
Nucleus The energy levels
2. 7 energy levels.
3. K , L , M , N , O , P , Q
4. K < L < M < N < O < P < Q

(7) 1. 11 2. Na 3. O

(8)

Atom	Electronic configuration			1. No. of electrons in outermost energy level	2. No. of neutrons
	K	L	M		
$^{7}_{3}Li$	2	1	–	1	4
$^{4}_{2}He$	2	–	–	2	2
$^{24}_{12}Mg$	2	8	2	2	12
$^{35}_{17}Cl$	2	8	7	7	18
$^{23}_{11}Na$	2	8	1	1	12

(9) 1. Atomic number = 2 + 8 + 8 + 2 = 20
2. Mass number = 2 × 20 = 40
3. No. of neutrons = 40 – 20 = 20

(10) 1. $^{27}_{13}Al$, because it is a good conductor of electricity.
2. $^{4}_{2}He$ 3. $^{23}_{11}Na$
4. filling of celebrations balloons – one atom.

(11) (1) The nucleus. (2) Proton.
(3) Neutron. (4) Electron.

(12) 1. Fig. (3) Because "K" level contains 2 electrons, and "L" level contains 6 electrons.
2. Fig. (1) Because an electron is transferred from "L" level to "M" level.

(14)

	Fig. (1)	Fig. (2)	Fig. (3)
1. Atomic number :	8	12	17
2. Mass number :	16	24	35
3. No. of electrons in the outermost level :	6	2	7
4. No. of energy levels having electrons :	2	3	3

Thinking Skills Questions

1 1. d 2. d 3. d 4. c 5. a

2 In fig. (1) • No. of electrons = 6 + 8 + 2
= 16 electrons.
• Atomic number = 16
• Mass number = 16 + 16 = 32
In fig. (2) • No. of electrons = 1 + 8 + 8 + 2
= 19 electrons.
• Atomic number = 19
• Mass number = 19 + 20 = 39

3 It is in an excited state, due to the transfer of one electron from energy level "L" to energy level "M".

Project On UNIT ONE Answer by Yourself

Unit Two

Lesson 1

1 1. b 2. c 3. c 4. a
5. a 6. b 7. d 8. d
9. a 10. b 11. a 12. a
13. c 14. c 15. a 16. b
17. c 18. b 19. b 20. a
21. c 22. (A) d (B) a (C) c 23. b
24. c 25. c

2 ① 1. c 2. d 3. e 4. b
② 1. c 2. e 3. d 4. a 5. b
③ 1. e 2. c 3. g 4. d
5. f 6. a

3 1. (✗) Energy is ……
2. (✗) …… has chemical energy
3. (✗) Heat energy ……
4. (✗) Weight of the object = ……
5. (✗) …… increases by ……
6. (✗) …… = Height × Weight.
7. (✓) 8. (✓)
9. (✓)
10. (✗) …… = $\frac{1}{2}$ × Mass × (Speed)^2
11. (✗) …… is less than ……
12. (✗) …… = Potential energy + Kinetic energy
13. (✗) …… increases. 14. (✓)
15. (✓) 16. (✓)
17. (✗) …… its potential energy is equal to ……

4 1. Energy 2. Joule 3. Work
4. Potential energy. 5. Potential energy.
6. Kinetic energy 7. Mechanical energy.

5 1. Energy – joule. 2. newton
3. zero.
4. Electric – chemical 5. light – heat
6. chemical – electric 7. weight – height
8. Mass – Acceleration due to gravity.
9. kg. – newton 10. Weight – Height.
11. mass – speed 12. Mass – (Speed)^2
13. greater 14. four times.
15. potential – kinetic
16. Potential energy – Kinetic energy.
17. potential – kinetic 18. increases – decreases
19. 150 joule

6 1. (1) Heat energy (2) Kinetic energy
(3) Electric energy (4) Light energy
(5) Loudspeakers
2. (1) 5 (2) 75 (3) 5 (4) 100 (5) 2

7 1. Because burning each of them produces energy which makes the car moves (do work) and the living organisms (man) makes its vital processes (do work).
2. Because they are cheap and clean resources of energy as they do not pollute the environment.
3. Because he does a work on the car.
4. Because object's weight =
Object's mass × Acceleration due to gravity.

5. Because the potential energy is directly proportional to the weight of the object, where potential energy = weight × height.
6. Because its height decreases gradually and the potential energy is directly proportional to the height of the object from the ground.
7. Because the height of the object from the Earth's surface at this moment equals zero and the potential energy of an object = Weight × Height.
8. Because the speed of the object becomes zero and the kinetic energy of an object equals $[\frac{1}{2} \times \text{Mass} \times (\text{Speed})^2]$.
9. Because by increasing the speed of the car, its kinetic energy increases, thus the work done to stop it increases.
10. Due to increasing its speed as the kinetic energy is directly proportional to the square of the speed of the moving object.
11. Because the kinetic energy of a moving object is directly proportional to its mass.
12. Because the mechanical energy of an object is the sum of potential and kinetic energies of the object and the kinetic energy at the maximum height equals zero, so the mechanical energy at the maximum height equals the potential energy only.
13. Because the decrease occurs in the potential energy of an object during falling equals the increase in its kinetic energy.
14. Because the mechanical energy of an object is the sum of potential and kinetic energies of the object.

8
1. It is the ability to do work.
2. It is the energy stored in the object due to the work done on it.
3. It is the work done during the motion of an object.
4. It is the sum of potential and kinetic energies of the object.

9
1. This means that the energy stored in the object due to the work done on it is 20 joule.
2. This means that the object is placed on the ground.
3. This means that the product of multiplying the mass of the object by the Earth's gravity acceleration equals 500 newton.
4. This means that the weight of the object equals potential energy ÷ height = 80 ÷ 10 = 8 newton.
5. This means that the potential energy of the object is 100 joule.
6. This means that the work done during the motion of the object is 20 joule.
7. This means that the object is at rest (its speed = zero).
8. This means that the sum of potential and kinetic energies of a moving body equals 100 joule.

10
1. Work = Force × Displacement.
2. Weight = Mass × Acceleration due to gravity.
3. Potential energy = Weight × Height.
4. & 5. Kinetic energy = $\frac{1}{2}$ × Mass × $(\text{Speed})^2$.
6. Mass = $\frac{2 \times \text{Kinetic energy}}{(\text{Speed})^2}$
7. Mechanical energy = Potential energy + Kinetic energy.

11
Cases (1) & (2) exert work.
Because the force acts on the body at rest and it moves a distance in the direction of such force.
Case (3) does not exert work.
Because he does not move a distance.

12
1. Chemical energy.
2. Mechanical energy.
3. Mechanical energy.
4. Potential energy.
5. Chemical energy.

13
1. He will not get the energy that enables him to carry out various vital activities (to do work)
2. The work done doesn't change.
3. Its potential energy is doubled.
4. Its kinetic energy increases four times.
5. Its mass doesn't change.
6. Its potential energy doesn't change.
7. Its kinetic energy is doubled.
8. Its kinetic energy is doubled.
9. The work done on it is stored in the form of potential energy which increases by increasing the height from the ground.
10. Its potential energy decreases gradually with the same value of increasing its kinetic energy.

14
1. Work done = Force × Displacement
= 20 × 1.5 = 30 joule.
2. Displacement = $\frac{\text{Work done}}{\text{Force}} = \frac{500}{25} = 20$ m.

3. Force = $\frac{\text{Work done}}{\text{Displacement}} = \frac{40}{2} = 20$ N.
4. Weight = Mass × Acceleration due to gravity
= 2 × 10 = 20 N.
Potential energy = Weight × Height
= 20 × 2 = 40 joule.
5. Potential energy = Weight × Height
= 100 × 2 = 200 joule.
6. Weight = Mass × Acceleration due to gravity
= 5 × 9.8 = 49 N.
7. Weight = $\frac{\text{Potential energy}}{\text{Height}} = \frac{88}{11} = 8$ N.
8. Weight = 5 × 10 = 50 N.
Potential energy = Weight × Height
= 50 × 10 = 500 joule.
Potential energy when the weight is doubled and the height is decreased to its half
= 2 × Weight × $\frac{\text{Height}}{2}$
= 2 × 50 × $\frac{10}{2}$ = 500 joule.
9. (a) Potential energy at the highest point
= Weight × Height
= 5 × 20 = 100 joule.
(b) P.E. at the ground = zero.
10. (a) Pot. energy = Weight × Height
= 10 × 5 = 50 joule.
(b) Kinetic energy = $\frac{1}{2}$ m $(V)^2$
= $\frac{1}{2}$ × 2 × 25 = 25 joule.
11. Kinetic energy of the basket ball
= $\frac{1}{2}$ × Mass × $(\text{Speed})^2$
= $\frac{1}{2}$ × 7.5 × (6 × 6) = 135 joule.
The mass of the billiard ball
= $\frac{2 \times \text{Kinetic energy}}{(\text{Speed})^2} = \frac{2 \times 135}{30 \times 30} = 0.3$ kg.
12. (a) Weight of object (A)
= Mass × Acceleration due to gravity
= 7 × 10 = 70 N.
Potential energy of object (A)
= Weight × Height = 70 × 6 = 420 joule.
(b) Potential energy of object (B)
= 50 × 10 = 500 joule.
∴ Potential energy of object (B) is larger than that of object (A).
13. - Kinetic energy = $\frac{1}{2}$ × Mass × $(\text{Speed})^2$
= $\frac{1}{2}$ × 0.85 × $(20)^2$ = 170 joule.
- The kinetic energy when the speed of the ball is doubled = $\frac{1}{2}$ × Mass × $(2 \times \text{Speed})^2$
= $\frac{1}{2}$ × 0.85 × $(2 \times 20)^2$ = 680 joule.
14. $\frac{1}{2}$ Mass = $\frac{\text{K.E.}}{(\text{Speed})^2} = \frac{64}{(4)^2} = 4$ kg.
Mass = 4 × 2 = 8 kg.
15. K.E. = $\frac{1}{2}$ × Mass × $(\text{Speed})^2$
$(\text{Speed})^2 = \frac{\text{K.E.}}{\frac{1}{2}\text{Mass}} = \frac{1000}{40} = 25$
Speed = $\sqrt{25}$ = 5 m/sec.
16. (a) Weight = Mass × Acceleration due to gravity
= 5 × 10 = 50 N.
Pot. energy = Weight × Height
= 50 × 8 = 400 joule.
Kinetic energy = zero.
(b) Pot. energy = Weight × Height
= 50 × 2 = 100 joule.
Mechanical energy = Pot. energy at the maximum height = 400 joule.
Kinetic energy = Mechanical energy − Pot. energy = 400 − 100 = 300 joule.
(c) Pot. energy = zero.
Kinetic energy = Mechanical energy
= 400 joule.
17. Mechanical energy
= Potential energy + Kinetic energy
= 500 + 1000 = 1500 joule.
18. (a) P.E. = Weight × Height
= 5 × 4 = 20 joule.
(b) K.E. = $\frac{1}{2}$ × Mass × $(\text{Speed})^2$
= $\frac{1}{2}$ × 0.5 × 100 = 25 joule.
Work done = Mechanical energy
= P.E. + K.E.
= 20 + 25 = 45 joule.
(c) P.E. at maximum height = Mechanical energy
= 45 joule.
P.E. = Weight × Height
Height = $\frac{\text{P.E.}}{\text{Weight}} = \frac{45}{5} = 9$ metres.

19. – Weight of the ball = 8 × 10 = 80 N.
  – P.E. at maximum height
  = Mechanical energy = 80 × 12
  = 960 joule.
  P.E. at 7 m height = 8 × 10 × 7 = 560 joule.
  K.E. at 7 m height = Mechanical energy – P.E.
  = 960 – 560 = 400 joule.

20. – The work done by the first player
  = (300 + 300) × 2 = 1200 joule.
  – The work done by the second player
  = (750 + 750) × 1 = 1500 joule.
  ∴ The work done by the second player is more than the work done by the first player.

21. (a) At point (C).
  (b) P.E. = Weight × Height
  = 10 × 20 = 200 joule.

15 (1)

Form of energy	Its sources
– Electric energy	– Solar cells. – Wind generator.
– Sound energy	– Loudspeakers. – Musical instruments.
– Light energy	– Electric lamps.
– Heat energy	– Heater. – Oven.

(2) ***Look at the main book on page (105).***

(3) Potential energy of an object depends on its weight and its height from the ground (Potential energy = Weight × Height).

(4) Kinetic energy of an object depends on its mass and speed.
Kinetic energy = $\frac{1}{2}$ × Mass × $(\text{Speed})^2$

(5) Because the Sun is a permanent resource, while wind and water motion are renewable resources which are cheap resources and do not pollute the environment.

(6) (D)

(7) (B)

Thinking Skills Questions

1 The kinetic energy of the body at the moment of colliding with the Earth's surface
$= \frac{1}{2} \times \text{Mass} \times (\text{Speed})^2 = \frac{1}{2} \times 25 \times (20)^2$
= 5000 joule
Potential energy of the body at maximum height
= 5000 joule
= Kinetic energy of the body at the moment of colliding with the Earth's surface.
Weight of body = 25 × 10 = 250 newton.
Height = $\frac{\text{Potential energy}}{\text{Weight}} = \frac{5000}{250}$
= 20 metres.

2 Mass of ball = D × V
= 8.8 × 100 = 880 gm.
Mass by kg = $\frac{880}{1000}$ = 0.88 kg.
Weight = Mass × Acceleration due to gravity
= 0.88 × 10 = 8.8 newton.
P.E. = W × H = 8.8 × 10 = 88 joule.

3 - Mechanical energy = the sum of potential and kinetic energies at point (B) = 900 joule.
- Weight = Mass × Acceleration due to gravity
= 5 × 10 = 50 newton.
- Potential energy at point (A) = 50 × 15
= 750 joule.
- Kinetic energy at point (A)
= Mechanical energy – Potential energy at point (A)
= 900 – 750 = 150 joule.

4 The ball (Y), because its volume is larger than that of ball (X), thus its mass and its weight are larger than the mass and the weight of ball (X), where they are from the same matter and the potential energy is directly proportional to the weight of the object at constant height.

5 1. (a) B (b) A & D
2. The ball (D), because its volume is less than that of ball (A) and the volume is inversely proportional to the density when they have equal masses.
3. (a) (✗) (b) (✓)

6 (a) 50 joules.
(b) The decrease of the potential energy
= 70 – 30 = 40 joules.
(c) Weight = $\frac{\text{Potential energy}}{\text{Height}} = \frac{40}{4}$ = 10 N

7 1. c 2. d

Lesson 2

1 1. c 2. b 3. b 4. c
5. d 6. a 7. c 8. c
9. d 10. c 11. d 12. c
13. c 14. a

2 1. (✓)
2. (✗) .... its potential energy is maximum.
3. (✗) .... decreases ....
4. (✗) .... an acidic solution and two different metals are dipped in it.
5. (✓)
6. (✗) .... chemical energy is converted into electric energy.
7. (✓)
8. (✗) Electric energy changes into kinetic energy ....
9. (✓)
10. (✗) .... cause chemical pollution ....
11. (✓) 12. (✓)

3 1. The law of conservation of energy.
2. Simple electric cell.
3. Electromagnetic pollution.

4 1. potential – kinetic 2. potential – kinetic
3. zero – mechanical 4. an acidic – metals
5. copper – zinc. 6. copper – zinc
7. electric – heat
8. electric – kinetic 9. electric – kinetic
10. chemical – heat 11. wars – killing
12. electromagnetic – noise

5 1. Chemical – Electric
2. Electric – Sound & light
3. Electric – Sound 4. Electric – Kinetic
5. Kinetic – Electric 6. Electric – Sound
7. Solar – Electric

6 1. Because at that position, the speed of the pendulum is maximum.
2. Because at the maximum point, the speed of the pendulum equals zero and the kinetic energy
= $\frac{1}{2}$ × Mass × $(\text{Speed})^2$
3. Because at the maximum point, the kinetic energy equals zero and the mechanical energy equals the sum of potential and kinetic energies.
4. Because the potential and kinetic energies of the object are interchanged during its movement, where the decrease in the potential energy equals the increase in the kinetic energy at any moment and vice versa.
5. Because in both of them, the potential energy and kinetic energy are interchanged without ending and the sum of such energies (mechanical energy) at any moment is constant.
6. Due to the flow of an electric current.
7. Because the chemical energy stored in the lemon is converted into electric energy.
8. Because the simple electric cell must have two different metal plates immersed in diluted sulphuric acid.
9. Because it is very hot as electric energy is changed into heat and light energies.
10. Because the battery stores chemical energy inside it which is converted into electric energy in the electric circuit.
11. To convert a part of mechanical (kinetic) energy of the car into electric energy which is converted into :
  – Light energy (in car lamps).
  – Sound energy (in car radio cassette).
  – Heat energy (in electric heater of car air conditioner).
12. Because some of them cause environmental pollution as :
  – Electromagnetic pollution.
  – Noise pollution.
  – Chemical pollution of air, water and soil.
  In addition to when man used them in :
  • Wars and killing.
  • Massive destruction.
13. Because they cause chemical pollution of air.
14. Because they cause chemical pollution of water, air and soil, and cause cancer and food poisoning.
15. Because some of these applications have negative effects on the environment.

7 1.

Energy used	Energy produced
1. Chemical	Electric
2. Electric	Heat
3. Kinetic	Electric
4. Potential	Kinetic
5. Electric	Sound
6. Electric	Kinetic
7. Electric	Heat
8. Chemical	Electric
9. Electric	Heat & light
10. Kinetic	Heat

8 1. Electric heater. 2. Simple pendulum.
3. Electric bell. 4. Electric lamp.
5. Electric fan. 6. Solar cell.
7. Nuclear reactor. 8. Car engine.

9 1. The pendulum moves on both sides around its rest position, where its speed decreases as it goes away from its rest position and is maximum when it passes its rest position during its movement.
2. Its kinetic energy is maximum, while its potential energy is minimum.
3. The rest pendulum moves, while the moving pendulum stops.
4. Its kinetic energy equals zero, while its potential energy is maximum.
5. An electric current flows through the wire.
6. The needle of the compass deflects in a certain direction as a result of passing an electric current in the wire.
7. The chemical energy stored in the fuel is changed by burning into heat energy which is changed into mechanical energy causing the operation of the car.
8. They cause chemical pollution of water, air and soil and hence cause cancer and food poisoning.
9. They cause the electromagnetic pollution.

10 1. - Potential energy at the highest point = Mechanical energy = 40 joule.
- Kinetic energy = zero.
2. Weight of the pendulum
= Mass × Acceleration due to gravity
= 0.08 × 10 = 0.8 newton.
(a) Height = $\frac{\text{Potential energy}}{\text{Weight}} = \frac{0.8}{0.8} = 1$ m.
(b) Kinetic energy at maximum displacement = zero.
3. (a) Weight = Mass × Acceleration due to gravity = 5 × 10 = 50 N
Height = $\frac{\text{P.E. at rest position}}{\text{Weight}} = \frac{50}{50} = 1$ m.
(b) P.E. at maximum height = Mechanical energy = 200 joule
4. (a) Weight = Mass × Acceleration due to gravity = 1 × 10 = 10 N
The mechanical energy = The potential energy at the highest point = Weight × Height = 10 × 1 = 10 joule
(b) $(\text{Speed})^2 = \frac{2 \times \text{K.E.}}{\text{Mass}} = \frac{2 \times 8}{1} = 16\ (\text{m/sec.})^2$
Speed = $\sqrt{16}$ = 4 m/sec.
5. At point (1) [maximum height] :
∵ Its speed is zero.
∴ Kinetic energy = zero.
∵ Its potential energy equals its mechanical energy.
∴ Potential energy = 40 joule.

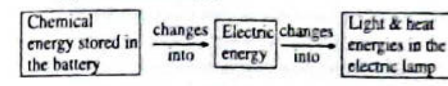
11 (1) Energy is neither created nor destroyed, but it is converted from one form to another.
(2) & (3) Answer by yourself.
(4) This is due to the presence of many technological applications that have a pollutant effect on the environment and we need to keep the surrounding environment from pollution, so we need such organizations.
(5) • The electric lamp converts the electric energy into heat and light energies.
• The electric fan converts the electric energy into kinetic energy.
• The dynamo converts the kinetic energy into electric energy.
• The solar cell converts the solar energy into electric energy.
• The motor converts the electric energy into kinetic energy.
(6) *Look at the main book on page (135).*

12 (1)

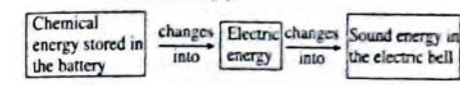
Position	Kinetic energy	Potential energy
(A)	Zero.	Maximum.
(B)	Maximum.	Minimum.
(C)	Zero.	Maximum.

(2) a. ① The compass needle deflects in a certain direction as a result of passing an electric current in the copper wire.
② The needle of the compass doesn't deflect.
③ The needle of the compass deflects.
b. Chemical – electric
(3) a. Simple electric cell.
b. (1) Copper plate. (2) Dil. sulphuric acid.
(3) Glass container. (4) Zinc plate.
c. It converts the chemical energy into electric energy.
d. The electric current passes from positive copper plate to negative zinc plate.

(4) Fig. (B) Mona.
(5) a. • In circuit (1) :



• : In circuit (2) :



b. I feel hotness of the electric lamp.
c. ① circuit (1).
② circuit (2).

Thinking Skills Questions

1 • Mechanical energy = Potential energy at the maximum height (C) = Weight × Height
= 5 × [0.5 + 0.3] = 5 × 0.8 = 4 joule.
• Potential energy at point (B) = 5 × 0.3 = 1.5 joule.
• Kinetic energy at point (B) = Mechanical energy – Potential energy at point (B)
= 4 – 1.5 = 2.5 joule.

2 1. No, the ball doesn't reach the position (P).
2. At point (Q), because it represents the maximum height that the ball reaches away from rest position, where the potential energy is directly proportional to the height.

3 1. - The potential energy at points (B & C) is maximum.
- The kinetic energy at point (A) is maximum.
2. When the string goes away from point (A) during its vibration, the potential energy increases and the kinetic energy decreases with the same value, while when the string returns to point (A), the potential energy decreases and the kinetic energy increases, where the sum of them (the mechanical energy) at any point is constant.

4 a. At positions (D) and (E).
b. At position (B).
c. At positions (A) and (C).

Lesson 3

1 1. b 2. c 3. d
4. c 5. d 6. a
7. b 8. d 9. c
10. c 11. c 12. c
13. a 14. c 15. a
16. d 17. c 18. b 19. b

2 (1) 1. d 2. a 3. c
(2) 1. b 2. c 3. d 4. a

3 1. (✓)
2. (✗) ____ is directly ____ 3. (✓)
4. (✗) ____ a hot object to a cold ____
5. (✗) ____ and radiation. 6. (✓)
7. (✗) ____ by conduction.
8. (✗) ____ by radiation.
9. (✗) ____ in gases and liquids by ____
10. (✓)
11. (✗) ____ its density increases, ____
12. (✗) ____ is less dense ____
13. (✗) ____, while electricity is a renewable resource ____
14. (✗) ____ into electric energy.

4 1. Heat energy. 2. Temperature.
3. The transfer of heat by conduction.
4. The transfer of heat by convection.
5. The transfer of heat by radiation.
6. The Sun.

5 1. mechanical – heat
2. their speed – their friction with each other.
3. higher – lower 4. directly
5. conduction – convection – radiation.
6. conduction – convection.
7. gases – space
8. conduction – convection.
9. electric heater – freezer
10. conduction – radiation.
11. decreases – up 12. convection – radiation.
13. radiation – convection – radiation.
14. permanent – non-renewable
15. Electric heater – solar heater – gas oven
16. pollute – don't pollute
17. chemical – heat

18. solar – heat 19. Solar – electric
20. solar – chemical

6

Technological application	The effect on the environment (Polluting / Non-polluting)
1. Electric heater :	Non-polluting.
2. Solar heater :	Non-polluting.
3. Electric stove :	Non-polluting.
4. Gas stove :	Polluting
5. Solar oven :	Non-polluting.
6. Electric water heater :	Non-polluting.

7
1. Because the kinetic energy is converted into heat energy by friction.
2. Because the friction of the bike frame with the brakes converts the mechanical energy into heat energy.
3. Because the temperature of objects is directly proportional to their speed.
4. Because the friction of the nail with the wooden piece during taking it off converts the mechanical energy into heat energy.
5. Because heat is transferred from the hot object (spoon) to the cold object (body) by conduction.
6. Due to transferring of heat from the hot metallic piece (higher in temperature) to the cold water (lower in temperature).
7. Because they are good conductors of heat and they have high melting points.
8. Because when air is cooled, its density increases, so it falls down to cool the food in the refrigerator (or to cool the room) and the hot air rises up to be cooled again and so on.
9. Because when air around the heater is heated, its density decreases, so it rises up to warm the room, while the cold air falls down to be heated again and so on.
10. Because there is a vast vacuum between the Sun and the Earth.
11. Because the transfer of heat by radiation doesn't need any material medium through which heat transfers.
12. Because Sun and electricity don't pollute the environment, while coal and petrol pollute the environment.
13. Because it is the main source of most energies on the Earth's surface.
14. Because nuclear stations don't pollute the environment, while petrol stations pollute the environment.
15. Because the Sun is a permanent source of energy, which doesn't pollute the environment, while fuel is a non-renewable source of energy which pollutes the environment.
16. Because solar energy is a clean source of energy which doesn't pollute the environment and it is a permanent source of energy.
17. Because solar heater depends on the Sun which is a permanent and cheap resource of energy.

8
1. It is a form of energy which is transferred from a higher temperature object to a lower temperature object.
2. It is the heat condition which determines the direction of heat energy whether from or to the object when it comes in contact with another.
3. It is the transfer of heat through some solid objects from the part of higher temperature to that of lower temperature.
4. It is the transfer of heat through liquids and gases, where hot molecules that have less density rise upwards, while colder molecules that have more density fall down.
5. It is the transfer of heat from hot object to another without any need for a material medium through which heat transfers.

9
1. Solar cell : It changes solar energy into electric energy. [It doesn't pollute the environment].
2. Solar heater : It changes solar energy into heat energy. [It doesn't pollute the environment].
3. Electric heater : It changes electric energy into heat energy. [It doesn't pollute the environment].
4. Electric iron : It changes the electric energy into heat energy. [It doesn't pollute the environment].
5. Petrol stove : It changes the chemical energy into heat energy. [It pollutes the environment].
6. Electric stove : It changes the electric energy into heat energy. [It doesn't pollute the environment].
7. Solar furnace : It changes the solar energy into heat energy. [It doesn't pollute the environment].
8. Solar battery : It changes the solar energy into electric energy. [It doesn't pollute the environment].

10
1. The mechanical energy changes into heat energy by friction.

2. The temperature of the tire rises.
3. The temperature of the nail rises.
4. Their kinetic energy increases, therefore their temperature rises.
5. The heat transfers from the hot object to the cold object until their temperatures become equal.
6. The heat transfers from the metallic piece of higher temperature (70°C) to that of lower temperature (30°C) until their temperatures become equal.
7. The heat doesn't transfer between them.
8. The heat transfers from the spoon to the hand by conduction.
9. The lower part of the refrigerator only is cooled, because the cold air (of high density) doesn't rise up.
10. The upper part only of air is heated inside the room.
11. It pollutes the environment.



The odd word	The scientific term
1. Friction	– Ways of heat transfer.
2. Sun	– Non-renewable resources of energy.
3. Petrol stove	– Technological applications don't pollute the environment.
4. Electric fan	– Technological applications convert the electric energy into heat energy.
5. Solar battery	– Technological applications convert the solar energy into heat energy.

12
1. *Look at the main book on page (155).*
2.

Points of comparison	Electric heater	Coal heater
– The effect on the environment :	Non-polluting	Polluting
– The resource of energy depending on it :	Electricity	Coal
– The kind of energy resource :	Renewable	Non-renewable

3. *Look at the main book on page (152).*
4. • **Solid matter :** The heat transfers through it by conduction.
   • **Liquid matter :** The heat transfers through it by convection.

13
(1) Conduction, convection and radiation.
(2) When their temperatures become equal (80°C).
(3) Answer by yourself.
(4) ***Look at the main book on page (152).***
(5) ***Look at the main book on page (152).***

14
(1) Because by increasing the speed of spheres and their friction with each other during shaking leads to increasing their kinetic energy and therefore their temperature rises.
(2) 1. b 2. a 3. b
(3) a. In fig. (1) by conduction.
In fig. (2) by convection and radiation.
b. From object (B) to object (A).
(4) • **Observation :** The cube of ice melts.
• **Conclusion :** Heat transfers through solids by conduction.
(5) In substance (A) : by conduction.
In substance (B) : by convection.

Thinking Skills Questions

1
(1) 1. a 2. d
(2) c (3) b (4) b

2
No, because there is no difference in temperature.

3
Solar energy or wind energy.

4
1. – In the covered beaker, the water changes into vapour then the vapour condenses into water.
– In the uncovered beaker, the water changes into vapour.
2. In the uncovered beaker, due to transfer of heat from it into the surrounding medium by convection and radiation, while in the covered beaker, the heat transfers by radiation only.

5
Because the density of smoke is less than the density of air, so it rises upwards faraway from the pupils.

6 a. In beakers (2 & 3), because they have the same temperature.

b. 1. The speed of water molecules in beaker (1), is greater than their speed in beaker (2), because the temperature of water in beaker (1) is higher than that in beaker (2).

2. The kinetic energy of water molecules in beaker (1) is greater than the kinetic energy of water molecules in beaker (2), because the temperature of molecules is directly proportional to their speed and thus their kinetic energy.

Project On UNIT TWO *Answer by Yourself*

Unit Three

Lesson 1

1

1. a	2. d	3. a	4. a
5. b	6. c	7. b	8. b
9. c	10. a	11. b	12. c
13. a	14. b	15. b	16. c
17. c	18. b	19. c	20. b
21. b	22. b	23. a	24. b
25. c	26. a	27. b	28. a

2 ① 1. b 2. f 3. h 4. c
5. a 6. e 7. d

② 1. d 2. e 3. g 4. b
5. f 6. c

3 1. (✗) Hippopotamus is .... 2. (✓)
3. (✗) .... a big-sized animal.
4. (✓) 5. (✓) 6. (✓)
7. (✗) Maize ....
8. (✗) Angiosperms are .... 9. (✓)
10. (✗) .... inside cones. 11. (✓)
12. (✗) .... from soft animals.
13. (✗) ...., while arachnids have four pairs of jointed legs.
14. (✗) .... to arachnids. 15. (✓)
16. (✓)
17. (✗) Hedgehog .... 18. (✓)
19. (✗) Species ....
20. (✗) Linnaeus ....

4 1. Micro-organisms. 2. Taxonomy.
3. Algae. 4. Ferns.
5. Gymnosperms. 6. Angiosperms.
7. Arthropods. 8. Insects.
9. Arachnids. 10. Myriapods.
11. Edentates. 12. Rodents.
13. Lagomorphs. 14. Species.

5 1. shape – size – way of feeding.
2. elephant – rabbit – rat.
3. External shape – way of reproduction
4. Camphor – palm trees – gargeer
5. banana plant – moulokhiyah plant.
6. Amoeba – paramecium
7. Green – red – brown
8. Maize – wheat
9. Adiantum – pine
10. gymnosperms – angiosperms.
11. Pine – cycas
12. cones – a pericarp.
13. monocotyledon – dicotyledon
14. Maize – wheat – bean
15. soft bodies – supported bodies.
16. soft – supported
17. internal – external
18. jointed legs.
19. insects – arachnids – myriapods.
20. four – spider.
21. three – locust – cockroach.
22. insects – arachnids – arthropods
23. Sloth – armadillo
24. teethless – teethed
25. rodents – lagomorphs.
26. Rodents – rat.
27. one pair – two pairs.
28. Species

6 1. Due to the enormous diversity in living organisms species, so they must be classified into groups to facilitate their study.
2. Because banana plant carries large-sized leaves, while molukhiyah plant carries small-sized leaves.
3. Because it is from unicellular organisms which can be seen only by the microscope.
4. Because it is a small terrestrial plant that reproduces by formation of spores.
5. Because it reproduces by formation of seeds which are formed inside cones and not inside a pericarp (fruit envelope).
6. Because their seeds are formed inside a pericarp.

7. Because their bodies don't have support.
8. Because they are arthropods that have three pairs of jointed legs.
9. Because they are arthropods that have four pairs of jointed legs.
10. Because it has four pairs of jointed legs, while insects have three pairs of jointed legs.
11. Because they are arthropods that have numerous legs.
12. Because they have no teeth.
13. To capture insects.
14. Because squirrel (or rat) has one pair of incisors in each jaw, while rabbit has two pairs of incisors in the upper jaw and one pair in the lower jaw.
15. Because each of them has its specific shape.
16. Because cats and rabbits are from two different species.

7 1. They are living organisms that can't be seen by the naked eye, but they spread everywhere around us (in air, water and soil).
2. It is a branch of biology that searches for the similarities and the differences among living organisms and it places the similar ones in groups according to a certain system in order to ease their study.
3. They are plants that can't be distinguished into roots, stems and leaves.
4. They are small terrestrial plants that reproduce by formation of spores.
5. They are plants that their seeds are formed inside cones.
6. They are flowering plants that their seeds are formed inside a pericarp.
7. They are invertebrate animals that are characterized by the presence of jointed legs.
8. It is a group of more similar living organisms in shape that can reproduce to give birth of new fertile individuals which are able to reproduce and keep the existence of the species.

8 1. Elephant. 2. Rat.
3. Crocodile. 4. Dog.
5. Camphor. 6. Clover.
7. Banana. 8. Molukhiyah.
9. Amoeba. 10. Alga.
11. Adiantum. 12. Pine.
13. Maize. 14. Pea.
15. Octopus. 16. Mussel.
17. Bird. 18. Cow.
19. Ant. 20. Spider.
21. Julius. 22. Armadillo.
23. Hedgehog. 24. Lion.
25. Rat. 26. Rabbit.

9 1. • **Bean plant** is a dicotyledon plant.
• **Wheat plant** is a monocotyledon plant.
2. • **Gymnosperms** form their seeds inside cones.
• **Angiosperms** form their seeds inside a pericarp.
3. • **Pine** is from gymnosperms.
• **Palm trees** are from angiosperms.
4. • **Adiantum** reproduces by formation of spores.
• **Bean** reproduces by formation of seeds.
5. • **Insects** have 3 pairs of jointed legs. [Ex.: Ant].
• **Arachnids** have 4 pairs of jointed legs. [Ex.: Spider].
6. • **Sloth** is a teethless animal.
• **Hedgehog** has front teeth extending outwards.
7. • **Rodents** have one pair of incisors in each jaw. [Ex.: Rat].
• **Lagomorphs** have 2 pairs of incisors in the upper jaw and one pair in the lower one. [Ex.: Rabbit].
8. • **Rabbit** is a lagomorph animal that has two pairs of incisors in the upper jaw and one pair in the lower jaw.
• **Squirrel** is a rodent animal that has one pair of incisors in each jaw.

10

The odd word	The scientific term
1. Lions	– Animals live in water.
2. Clover	– Micro-organisms.
3. Palm	– Plants reproduce by formation of spores.
4. Pine	– Angiosperms.
5. Rabbit	– Arthropods.
6. Spider	– Insects.
7. Hedgehog	– Animals have sharp incisors.
8. Armadillo	– Mammals with teeth.
9. Snails	– Animals with internal support.
10. Desert snail	– Animals with soft bodies.

11 1. It is unable to capture insects.
2. It produces new fertile individuals from the same species.
3. The produced offspring will be a sterile female called "mule".

12 ① (1) spores. (2) seeds.
(3) Vougheir (4) Gymnosperms.
(5) Pine (6) Cycas.
(7) Monocotyledon (8) Dicotyledon
(9) Maize. (10) Bean.

② (1) Animals with supported bodies.
(2) Animals with soft bodies.
(3) Internal support. (4) Octopus
(5) Jellyfish. (6) Mussels
(7) Snails. (8) Fishes
(9) Reptiles.

13 1. Putting taxonomic plans of classification of living organisms.
2. **Answer by yourself.**
3. (a) 4 (b) 6 (c) zero
(d) 4 (e) 2

14 1. Micro-organism moves by cilia.
2. Monocotyledon plant.
3. Animal has pointed canines and molars with sharp projections.
4. Plants can't be distinguished into roots, stems and leaves.
5. Animal with external support.
6. A rodent animal has one pair of incisors in each jaw.

15 ① 1. **Fig. (1) :** Amoeba. **Fig. (2) :** Euglena.
Fig. (3) : Paramecium.
Similarities : All of them are micro-organisms.
Differences : They differ in shape and way of movement.
2. ***Look at the main book on page (171).***

② 1. **Maize plant** is monocotyledon, while **bean plant** is dicotyledon.
2. Each of them reproduces by formation of seeds.
3. Wheat plant.

③ 1. **Plant (1) :** Dicotyledon plant.
Plant (2) : Gymnosperm plant.
2. **Plant (1) :** Inside a pericarp.
Plant (2) : Inside cones.
3. cone.

4. **Plant (1) :** It is distinguished into roots, stems and leaves.
Algae : They can't be distinguished into roots, stems and leaves.

④ 1. A mammal lagomorph animal that has sharp incisors.
2. It has two pairs of incisors in the upper jaw and one pair in the lower jaw.
3. • **Similarity :** The lower jaw of each of them contains one pair of incisors.
• **Difference :**
Rabbit : The upper jaw of it contains two pairs of incisors.
Rat : The upper jaw of it contains one pair of incisors.

⑤ 1. Small terrestrial plant (fern).
2. Animal which has a soft body.
3. Insect (has three pairs of jointed legs).
4. Myriapod (has large number of jointed legs).
5. Teethless mammal (edentate).
6. Gymnosperm plant.
7. Mammal with front teeth extending outwards.
8. Dicotyledon plant.
9. Arachnid (has four pairs of jointed legs).

Thinking Skills Questions

1 1. • **Rat : fig. (Y)**, because it has one pair of incisors in each jaw.
• **Tiger : fig. (X)**, because it has pointed canines and molars with sharp projections.
• **Rabbit : fig. (Z)**, because it has two pairs of incisors in the upper jaw and one pair in the lower jaw.
• **Hedgehog : fig. (W)**, because its front teeth extending outwards.
2. a. Insects. b. Meat.

2 c

3 1. a. D 2. c. A
3. e. B 4. b. E
5. d. C

Lesson 2

1

1. b	2. b	3. c	4. c
5. a	6. c	7. b	8. d
9. b	10. b	11. a	12. c
13. a	14. c	15. a	16. b
17. b	18. d	19. d	20. c
21. a	22. a	23. a	24. d
25. c	26. c	27. a	28. c
29. a	30. c		

2 (1) 1. b 2. a 3. d
(2) 1. d 2. c 3. e 4. a

3 1. C . d 2. E . g 3. F . b 4. B . e
5. G . a 6. A . c 7. D . f

4 1. (✗) .... behavioural adaptation.
2. (✓)
3. (✗) Some mammals ______
4. (✗) .... into paddles.
5. (✗) .... in monkeys ______ 6. (✓)
7. (✗) The four fingers ______ 8. (✓)
9. (✗) .... have wide indented ______
10. (✗) .... to make proteins.
11. (✗) .... are autotrophic ______
12. (✓)
13. (✗) Some reptiles hibernate in winter ______
14. (✗) .... aestivate ______
15. (✓)
16. (✗) .... , while frog ______
17. (✗) .... shortage of water ______
18. (✗) In winter, ______
19. (✗) .... inherited behaviour.
20. (✓)
21. (✗) Leaf insect______ 22. (✓)

5 1. Adaptation.
2. Structural (anatomical) adaptation.
3. Functional adaptation.
4. Behavioural adaptation.
5. Insectivorous (Predacious) plants.
6. Hibernation.
7. Aestivation. 8. Birds migration.
9. Camouflage.

6 1. Climate change – food diversity – existence of water
2. strong solid hoof – thick flat pad
3. functional – behavioural.
4. structural
5. behavioural – functional
6. Getting food – escaping from the enemies
7. paddles – swimming – wings – flying
8. elongated – climb – catch
9. Beaks – legs
10. Vultures – hawks
11. claws 12. pouncing the preys
13. Heron – hoopoe 14. palm – swimming
15. strong and sharp crooked – wide indented
16. autotrophic – photosynthesis
17. Dionea – halophila
18. Hibernation – aestivation – birds migration
19. reptiles – insects
20. hibernation – aestivation
21. Jerboa – desert snail – some insects
22. lighted – warmer – reproduction
23. Leaf insect – stick insect 24. Leaf – stick
25. structural – functional – behavioural

7 1. To cope with the environmental changes.
2. To enable the camel wandering through the hot desert sand.
3. To help the horse go through the rocky soil.
4. Because functional adaptation represents a modification in a specific organ to be able to do a specific function (secreting poison), while anatomical adaptation represents a modification in the structure of one of body organ to cope with the environmental conditions (horse limb).
5. Because it represents a modification in a specific organ to be able to do a specific function (secreting sweat).
6. Because it represents a modification in the behaviour of birds at a certain time in order to survive.
7. To get food, move in different environments and escape from their enemies in dangerous situations.
8. To match with the way of movement, the animal life style and the dominant environmental conditions.
9. To perform the function of swimming and diving in water.
10. To perform the function of flying.
11. To perform the function of climbing trees and catching things.
12. Due to the modification of front limbs to suit the way of movement, where in dolphin, they are modified into paddles to perform the function of swimming and diving, while in bat, they are modified into wings to perform the function of flying.
13. To suit the way of movement, the type of food that the bird feeds on and the environmental conditions.
14. To tear their prey's flesh.
15. To control pouncing the prey.
16. The beaks are long and thin to pick up worms and snails and their legs are long thin ending in thin toes to walk in existence of water.

17. The beaks are wide indented to help them to filter the food from water and the palm legs to help them in swimming.
18. Because they can make their own food (carbohydrates) by photosynthesis process.
19. To pounce and digest the insects, then absorb the nitrogenous substances that the plants need.
20. To absorb the nitrogenous substances that their bodies need.
21. To overcome the decrease in temperature.
22. To overcome extreme rise in temperature and shortage of water and rains.
23. To search for more lighted and warmer regions for reproduction.
24. Because in winter, quail bird migrates from cold and polar regions to more lighted and warmer regions for reproduction at the same time every year.
25. Because it looks like the plant leaf exactly in its colour and shape of wings.
26. Because it looks like the branches of plants as well.
27. To be hidden from its preys of insects to capture them and feed on them.
28. Because it is considered one of the most adapted animals to live in desert environment.

8
1. To help the camel to walk on hot desert sand.
2. To enable it running on a rocky soil.
3. To obtain the food and to escape from their enemies.
4. To help plants in adjusting themselves with the different environmental conditions.
5. To perform the function of flying.
6. To perform the function of swimming and diving in water.
7. To help them in climbing trees and catching things.
8. To tear the prey's flesh.
9. To control pouncing the prey.
10. To pick up worms and snails.
11. To walk in the existence of water.
12. To help them filter the food from water.
13. To help them in swimming.
14. To be hidden from enemies and preys.

9
1. Horse. 2. Camel.
3. Camel limbs.
4. Secreting poison in some snakes.
5. Birds migration. 6. Whale.
7. Bat. 8. Monkey.
9. Hawk or vulture.
10. Hawk or vulture. 11. Hawk or vulture.
12. Hoopoe or heron. 13. Heron or hoopoe.
14. & 15. Duck. 16. Dieonea.
17. Frog.
18. Jerboa. 19. Quail bird.
20. & 21. Leaf insect.
22. Stick insect. 23. Chameleon.

10
1. It is a modification of a living organism's behaviour, body structure, or even the biological functions of its organs to become more adapted to the environmental conditions where it lives in.
2. It is a modification in the structure of one of body organs of a living organism to cope with the environmental conditions.
3. It is a modification in some tissues and organs of the body of a living organism to become able to do specific functions.
4. It is a modification in the behaviour of a living organism at specific times of the day or year.
5. They are autotrophic green plants that their roots can't absorb the nitrogenous substances from the soil needed to make proteins.
6. It is the behaviour through which some animals dormant and stop most of their vital activities to avoid the low temperature in winter.
7. It is the behaviour through which some animals some animals dormant and stop most of their vital activities to avoid the extreme rise in temperature in summer and shortage of water and rains.
8. It is the inherited behaviour in some species of birds, where they migrate from cold and polar regions to more lighted and warmer regions for reproduction.
9. • It is the ability of some living organisms to be hidden from their enemies or to capture the preys in the predatory species.
   • **Example :** Stick insect looks like the branches of plants.

11
1. The feet of the camel sinks into the sand, and the horse cannot run on the rocky soil.
2. They become unable to swim and dive in water.
3. They become unable to climb trees and catch things.
4. They become unable to fly.
5. They become unable to tear the flesh of preys.
6. They become unable to control pouncing their preys.
7. They become unable to filter their food from water.
8. They become unable to swim.
9. It can't pick up worms and snails.
10. Hoopoe feeds on meat and hawk feeds on worms and snails.
11. They cannot make their needed proteins.
12. It will die, because it can't tolerate the extreme rise in temperature and shortage of water and rains.
13. They will die, because they don't obtain the enough food during aestivation.
14. It will die, because it can't tolerate the extreme cold.
15. They are unable to make reproduction process and may die.
16. Chameleon can't capture its preys for feeding, and it may be seen by its enemies which prey it.
17. It is easily to be discovered by its enemies.

12
1. Structural adaptation and they end in a flat thick pad to enable it walking on hot desert sand.
2. Structural adaptation and they end in a strong solid hoof to enable it running on rocky soil.
3. Structural adaptation and they are modified to become paddles to perform the function of swimming and diving in water.
4. Structural adaptation and they are modified into wings to perform the function of flying.
5. Structural adaptation and their bones are elongated to enable it climbing trees and catching things.
6. Structural adaptation and strong and sharp crooked beaks to tear the prey's flesh.
7. Structural adaptation and long thin beak to help it in picking worms and snails.
8. Structural adaptation and wide indented beak in the two sides to filter the food from water.
9. Structural adaptation and they have four fingers ending in strong sharp claws to control pouncing the prey.
10. Structural adaptation and long thin legs ending in thin fingers to suit walking in existence of water.
11. Structural adaptation and palm legs to help them in swimming.
12. Structural adaptation and some parts of these leaves are adapted and modified to pounce and digest insects and absorb the nitrogenous substances that their bodies need.

13
1. Anatomical (structural) adaptation.
2. Functional adaptation.
3. Behavioural adaptation.
4. Behavioural adaptation.
5. Functional adaptation.
6. & 7. Structural adaptation.

14
1. Their beaks are wide indented in the two sides to help them filter the food from water.
2. Its beak is long and thin to pick up worms and snails.
3. Its front teeth are extending outwards to capture insects.
4. Some parts of its leaves are adapted and modified to pounce and digest insects to get the needed protein.

15

The odd word	The scientific term
1. Food adaptation	- Types of adaptation.
2. Respiration	- Types of movement in mammals.
3. Feathers related to birds	- From forms of functional adaptation.
4. Bats	- Mammals their front limbs are modified into paddles.
5. Ducks	- Predatory birds.
6. Sea lion	- Birds feed on fish.
7. Elodea	- Insectivorous plants.
8. Extinction	- Some forms of adaptation in living organisms.
9. Jerboa	- Animals do hibernation.
10. Toads	- Animals do aestivation.

16
1. *Look at the main book on page (193).*
2. *Look at the main book on page (194).*
3. *Look at the main book on page (194).*
4. *Look at the main book on page (196).*
5. & 6. *Look at the main book on page (197).*
7.

P.O.C.	Frogs	Desert snail
Type of adaptation :	Behavioural adaptation by hibernation.	Behavioural adaptation by aestivation.
The feature of adaptation :	They bury themselves in mud, stop feeding and their activities decrease.	It hides in humid burrows avoiding the effects of high temperature.
The reason of adaptation :	To overcome the decrease in temperature.	To overcome the extreme rise in temp., shortage of water and rains.

8.

Points of comparison	Aestivation	Hibernation
• Time of occurrence :	In summer.	In winter.
• Purpose :	To avoid high temperature and shortage of water.	To avoid low temperature.
• How does it take place ?	Animals become dormant and hide in humid burrows.	Animals hide in burrows or bury themselves in mud, stop feeding and decrease their activities.
• Examples of animals :	Jerboa, desert snail, and some insects.	Reptiles, some insects, and frogs.

17 1. Some adaptations took place in mammals, limbs to suit the way of movement.
2. Their beaks are modified into several shapes.
3. Their front limbs are modified to suit the ways of movement.
4. It can hide from its enemies.

18 1. ***Look at the main book on page (194).***
2. ***Look at the main book on page (195).***
3. Walking, flying, swimming, climbing and diving.
4. Hibernation, aestivation and birds migration.

19 1. By camouflage. 2. By aestivation.
3. By camouflage. 4. By migration.
5. By camouflage.

20 1. To search for more lighted and warmer regions for reproduction.
2. It is a behavioural adaptation.
3. Quail bird.

21 **Answer by yourself.**

22 1. Fig. (A) : Hawk.
Fig. (C) : Goose.
2. Fig. (A) : Strong and sharp crooked beak to tear the prey's flesh.
Fig. (B) : Long thin beak to pick worms and snails.
Fig. (C) : Wide indented beak in the two sides to filter the food from water.
3. Fig. (B) : Shallow water worms and snails.
Fig. (C) : Mosses and fish.
4. **Answer by yourself.**

Thinking Skills Questions

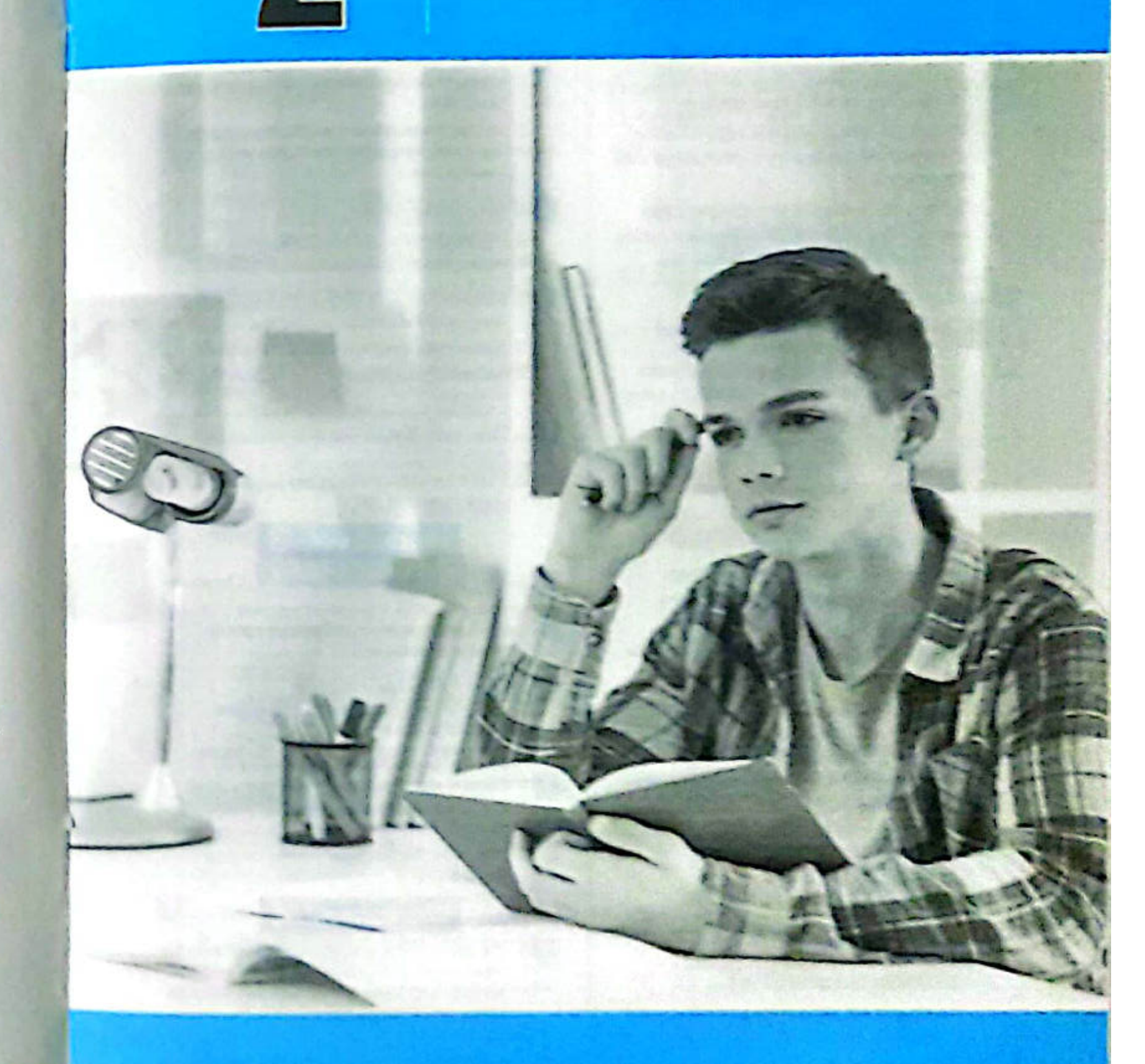
1 1. a. Fig. (1) : It has long thin beak & long thin legs ending in thin fingers.
Fig. (2) : It has wide indented beak in the two sides & palm legs.
b. Fig. (1) : Bird feeds on worms and snails of shallow water.
Fig. (2) : Bird feeds on mosses and fish.
2. a. Fig. (1) : Wide indented in the two sides.
Fig. (2) : Long thin.
Fig. (3) : Strong and sharp crooked.
b. Yes, because it has palm legs.
3. Fig. (1) Bat / The front limbs are modified into wings.
Fig. (2) Dieonea plant / some parts of leaves are modified.
Fig. (3) Dolphin / The front limbs are modified into paddles.

2 a. To absorb nitrogenous substances that they need.
b. Autotrophic, because they can make their food (carbohydrates) by photosynthesis process.
c. Dieonea, drosera and halophila.
d. Structural adaptation.

3 a. - The snake : functional adaptation.
- The bat : behavioural adaptation.
- The monkey : structural adaptation.
b. ***Look at the main book on page (196).***

Project On UNIT THREE *Answer by Yourself*

PART 2 Guide Answers of Worksheets



Worksheet 1

1 1. smell.
2. Wood – cork – iron nail – metallic coin
3. the mass – gm/cm^3 4. Gram – cm^3
5. Hardness – electric conduction – thermal conduction

2 1. a 2. b 3. a 4. a 5. a

3 1. Because they have different densities.
2. Because the density of iron is higher than that of water, while the density of cork is lower than that of water.
3. Because the density of petrol is lower than that of water, so petrol floats on water surface and water doesn't put out the petrol fires.

4 A. (1) 11 (2) 0.25 (3) 15
B. 1. (a) < (c) < (b) 2. (b) < (c) < (a)

5 1. The volume of iron = The volume of water and the piece of iron – The volume of water
= 110 – 100 = 10 cm^3

The density of iron = $\frac{\text{Mass}}{\text{Volume}} = \frac{78}{10}$ = 7.8 gm/cm^3

2. The volume of five pieces of copper
= 75 – 60 = 15 cm^3

Volume of each piece = 15 ÷ 5 = 3 cm^3

Mass of each piece = Volume × Density
= 3 × 8.8 = 26.4 gm.

3. The mass of the liquid = The mass of the cylinder containing liquid – The mass of the empty cylinder = 156 – 56 = 100 gm.

Density of the liquid = $\frac{\text{Mass}}{\text{Volume}} = \frac{100}{100}$
= 1 gm/cm^3

4. The mass of water = The mass of graduated cylinder filled with water – The mass of empty graduated cylinder
= 30 – 20 = 10 gm.

∵ Density of water = 1 gm/cm^3

∴ Volume of water = $\frac{\text{Mass}}{\text{Density}} = \frac{10}{1}$ = 10 cm^3

∵ The volume of unknown liquid
= Volume of water = 10 cm^3

The mass of the unknown liquid = The mass of graduated cylinder filled with unknown liquid – The mass of empty graduated cylinder.
= 27 – 20 = 7 gm.

∴ Density of unknown liquid = $\frac{M}{V} = \frac{7}{10}$
= 0.7 gm/cm^3

Worksheet 2

1 1. It is the temperature at which the substance begins to change from the solid state to the liquid state.
2. It is the temperature at which the substance begins to change from the liquid state to the gaseous state.

2 1. Wax – butter – iron – copper
2. boiling points. 3. Rubber – coal
4. copper-gold – nickel-chrome

3 1. Because they have high melting points and they are good conductors of heat.
2. Because the melting point of ice is low.
3. Because the hardness of iron is more than that of copper.

4 1. This means that ice begins to change into water at 0°C.
2. This means that water begins to change into water vapour at 100°C.

Worksheet 3

1 1. Ice. 2. Sodium. 3. Nickel. 4. Chromium.

2 Fig. (1), because acidic solution is a good conductor of electricity.

3 1. Silver – platinum – inactive
2. Acidic – alkaline – sugary – hydrogen chloride in benzene
3. aluminium – copper – good 4. rusting.

4 1. Because steel iron is very hard and a good conductor of electricity, while its plastic handle is a bad conductor of electricity.
2. To remove the rust layer formed on their surfaces.

Worksheet 4

1 1. The odour of the perfume spreads all over the room, because the molecules of the perfume are in a continuous motion and they keep the properties of the perfume.
2. The volume of the mixture will be less than 150 cm^3 because some molecules of alcohol occupy the intermolecular spaces among water molecules.
3. You can't break the iron piece, because the intermolecular forces among iron molecules are very strong.

2 1. molecules.
2. intermolecular spaces – intermolecular forces – indefinite
3. Liquids – gases

3 1. Because the molecules of ink are in a continuous motion in all directions among water molecules.
2. Because the intermolecular spaces among their molecules are very narrow and the intermolecular forces are very strong, so the molecules are relatively fixed in their positions.
3. Because the intermolecular forces among the water molecules are weak.

4 **Molecule :** It is the smallest part of matter which can exist freely and it has the properties of matter.
Properties of the molecules of matter :
– Molecules of matter are in a continuous motion.
– There are intermolecular spaces among the molecules of matter.
– There are attraction forces among the molecules of matter.

Worksheet 5

1 A. 1. Because by heating, solid molecules gain thermal energy, so their speed increases causing the weakness of the intermolecular forces and the intermolecular spaces increase, so molecules become more freely and changed from the solid state to the liquid state.
2. Because the speed of water molecules increases and some of them overcome the intermolecular forces and the intermolecular spaces increase, so they escape in the form of vapour.
B. 1. gain – gaseous 2. solids – gases.

2 A. 1. (✗) 2. (✗) 3. (✗)
B. 1. It is the change of matter from solid state to liquid state by heating.
2. It is the change of matter from liquid state to gaseous state by heating.

3

Points of comparison	Solid state	Liquid state	Gaseous state
1. Motion of molecules :	Limited motion	More free	Completely free
2. Intermolecular spaces :	Very small	Intermediate	Very large
3. Intermolecular forces :	Very strong	Intermediate	Very weak
4. Volume :	Definite	Definite	Indefinite
5. Shape :	Definite	Indefinite	Indefinite
6. Example :	Iron	Oil	Oxygen

4 A. (1) Solid (2) Melting
(3) Gaseous (4) Condensation
B. The water converts into water vapour.

Worksheet 6

1 A. 1. Element. 2. Compound.
3. Element molecule. 4. Water molecule.

B.

The odd word	The scientific term
1. Oxygen	Nobel gases.
2. Water	Elements.
3. Aluminium	Compounds.

2 1. c 2. c 3. d 4. d 5. a

3 A. 1. (✓) 2. (✗) ____ are similar to ____
3. (✗) Hydrogen chloride is a compound, while sulphur is an element.
4. (✗) ____ of two or more different elements.

B.

O_2	O
It is an oxygen molecule consists of two similar atoms.	It is a single atom of oxygen.

4 A. 1. two – one 2. mercury – bromine.
3. two – one

B.

Points of comparison	Element	Compound
• Definition :	It is the simplest pure form of matter which can't be analyzed chemically into simpler form.	It is a substance which is formed from combination of atoms of two or more different elements with constant weight ratios.
• Atoms :	Similar	Different
• Examples :	Hydrogen, oxygen, ___	Water, ammonia, ___

Worksheet 7

1 1. b 2. d 3. a 4. d 5. d

2 **A.** 1. (x) .... different masses.

2. (x) Volume is ....

3. (x) The intermolecular forces ....

B. 1. It is the amount of matter that the body contains.

2. It is the smallest part of matter which can exist freely and it has the properties of matter.

3 **A.** 1. hydrogen – helium

2. good conductors – bad conductor

3. Mercury – bromine

B. 1. Because we can differentiate between them by taste property.

2. Because it is formed from the combination of four atoms of two different elements with constant weight ratios.

4 **A.** The violet colour of permanganate spreads through all the water.

B. 1. Density of liquid (A)

$= \frac{Mass}{Volume} = \frac{27}{30} = 0.9\ gm/cm^3$.

Density of liquid (B)

$= \frac{Mass}{Volume} = \frac{45}{40} = 1.125\ gm/cm^3$.

2. Liquid (B) will be at the bottom because its density is more than that of liquid (A).

Worksheet 8

1 **A.** 1. Neutron. 2. Atomic number.

3. Atom. 4. Mass number.

B.

Element	Its symbol	Element	Its symbol
1. Copper	Cu	9. Nitrogen	N
2. Chlorine	Cl	10. Silicon	Si
3. Aluminium	Al	11. Silver	Ag
4. Carbon	C	12. Iron	Fe
5. Mercury	Hg	13. Gold	Au
6. Calcium	Ca	14. Potassium	K
7. Sodium	Na	15. Lead	Pb
8. Magnesium	Mg	16. Zinc	Zn

2 1. Because it contains protons which are positively charged and neutrons which are electrically neutral.

2. Because the mass number is the sum of numbers of protons and neutrons inside the nucleus, while atomic number is equal to the number of protons only.

3. Because the symbol is derived from Latin name, so that the symbol of this element differs from its name in English language.

3 **A.** 1. 11 2. 12

B. - The value of the positive charge of the nucleus changes, the atomic and mass numbers change so, the element changes into another element.

4 1. & 2. *Look at the main book on pages (68 , 70).*

Worksheet 9

1 **A.** 1. Because the energy of (K) level is less than that of the energy (L) level.

2. Because the electron has a negligible mass relative to the mass of the proton or neutron.

3. Because the number of negative electrons which revolve around the nucleus is equal to the number of positive protons in the nucleus.

B.

Nucleus

K L M N O P Q

1. K 2. Q

2 **A.** 1. high speed – energy levels.

2. seven.

B. 1. Electrons. 2. Energy levels.

3. Quantum.

3 1. It transfers to a higher energy level and the atom becomes excited atom.

2. The atomic number of the atom is equal to its mass number.

3. It returns back to its original energy level and the atom returns to its ground (original) state.

Worksheet 10

1

Element symbol	Atomic no.	Mass no.	No. of protons	No. of electrons	No. of neutrons	Electronic configuration		
						K	L	M
$^{24}_{12}Mg$	12	24	12	12	12	2	8	2
$^{12}_{6}C$	6	12	6	6	6	2	4	
$^{35}_{17}Cl$	17	35	17	17	18	2	8	7

2 **A.** 1. 18 – 32 2. $(2n^2)$ 3. 3 – 6

B. 1. Because the outermost energy levels of their atoms are completely filled with electrons.

2. Because the atom becomes unstable if the energy level contains more than 32 electrons.

3 **A.** 1. 18 2. 40 3. 18 4. 22

B. 1. Helium ....

2. Nitrogen ($_7N$) is ...., while neon ($_{10}Ne$) is ....

4 **A.**

Element	Atomic no.	Mass no.	No. of electrons in the outer level	No. of energy levels having electrons
Fig. (A)	8	16	6	2
Fig. (B)	12	24	2	3
Fig. (C)	17	35	7	3

B.

Points of comparison	Active elements	Inactive elements
• The electrons in the outer level :	Less than 8 electrons	8 electrons (except (He))
• Chemical activity :	They take part in chemical reactions	They don't take part in the chemical reactions
• Examples :	Hydrogen – Oxygen – Nitrogen – Fluorine – Chlorine	Helium – Neon – Argon – Krypton – Xenon – Radon

5 **A.** 1.

K L M

2 8 3

2. Atomic number = 13

Mass number = 13 + 14 = 27

3. Active.

B. 1. Atomic number = No. of electrons

= 2 + 8 + 8 = 18

2. Mass number = 18 + 22 = 40

General Exercise of the School Book on Unit One

1 **A.** 1. f 2. a 3. d 4. e

5. c 6. g 7. b

B. 1. The molecule. 2. Melting point.

3. The atom. 4. Energy levels.

5. The element.

2 1. Because there are strong attraction forces among iron molecules.

2. Because the energy levels are saturated with electrons according to the rule $(2n^2)$, so the electrons that saturate "M" level

$= 2 \times (3)^2 = 18$ electrons.

3. Because when the table salt dissolves in water, the molecules of table salt spread in the intermolecular spaces among water molecules.

4. Because the number of negative electrons that revolve around the nucleus is equal to the number of positive protons in the nucleus.

5. Because molecules of various substances differ from each other in :

a. number of atoms. b. kind of atoms.

c. way of combination between atoms.

6. Because the outermost energy levels of their atoms are completely filled with electrons.

3 **A.**

Atom	Electronic configuration			Atomic no.	No. of neutrons	Mass no.	No. of electrons
	K	L	M				
$^{27}_{13}Al$	2	8	3	13	14	27	13
$^{20}_{10}Ne$	2	8	-	10	10	20	10
$^{7}_{3}Li$	2	1	-	3	4	7	3
$^{32}_{16}S$	2	8	6	16	16	32	16

B. 1. Density (D) = $\frac{Mass\ (M)}{Volume\ (V)}$

2. The number of electrons which saturates the first four energy levels = $(2n^2)$, where (n) is the number of the energy level.

Model Exam 1 on Unit One

1 **A.** 1. molecules – atoms 2. Protons – neutrons

3. one – two

4. iron – nickel-chrome

B. 1. Boiling point.

2. Excited atom.

3. Intermolecular forces.

4. Atomic number.

C. Because the number of protons in the nucleus of calcium atom equals 20.

2 A. 1. (✗) .... is more than ....
2. (✗) .... gains a quantum of ....
3. (✗) Sodium ....
4. (✗) Bromine ....

B. 1. a 2. e 3. d 4. b

C. This means that the mass of 1 cm^3 of aluminium is 2.7 gm.

3 A. (1) Compound molecule.
(2) Two hydrogen atoms and one oxygen atom.
(3) Oxygen molecule.
(4) Element molecule.
(5) Compound molecule.
(6) One hydrogen atom and one chlorine atom.
(7) Compound molecule.
(8) Three hydrogen atoms and one nitrogen atom.

B. 1. b 2. c 3. b 4. b

C. It begins to change from the liquid state to the gaseous state.

4 A.

Find :	Fig. (1)	Fig(1)
1. Number of electrons	6	11
2. Atomic number	6	11
3. Mass number	12	23
4. Element name	Carbon	Sodium

B. (2) < (3) < (1)

C. Density = $\frac{\text{Mass}}{\text{Volume}} = \frac{35}{25} = 1.4$ gm/cm^3.

Model Exam 2 on Unit One

1 A.

The odd word	The scientific name
1. Nitrogen.	Inert gases.
2. Angestrom.	Components of the atom.
3. Ammonia.	Elements.
4. Iron nail.	Substances float on water surface.

B. (1) Melting. (2) Vaporization.
(3) Condensation. (4) Freezing.

C. - **Hydrogen :** It is a diatomic gas.
- **Helium :** It is a monoatomic gas.

2 A. 1. b 2. b 3. d 4. a

B. 1. Copper. 2. Rubber.
3. Sugary solution. 4. Argon.

C. Density = $\frac{\text{Mass}}{\text{Volume}}$

3 A. 1. Nickel-chrome
2. positively
3. Mercury
4. different

B. 1. (✓) 2. (✗) 3. (✗) 4. (✗)

C. Because hydrogen atom doesn't contain neutrons, so the mass no. = the atomic no. = the no. of protons.

4 A. 1. Na – S 2. Sugary – salt
3. Liquids – solids 4. 7 – 18

B. 1. 5 minutes.
2. E

C. Mass = Density × Volume.
= 0.5 × 10 = 5 gm.

Worksheet 11

1 1. Force – Displacement. 2. light – chemical
3. The Sun – wind – food 4. sound – electric
5. mechanical energy – heat energy.

2 A. 1. Energy. 2. Chemical energy.

B. 1. 50 joule.
2. 70 – 30 = 40 joule.
3. Weight = $\frac{\text{Potential energy}}{\text{Height}} = \frac{40}{4} = 10$ newton.

3 A. 1. a 2. c 3. b 4. c

B. 1. Because the Sun is a permanent resource, while wind and the movement of water are renewable resources which are cheap resources and do not pollute the environment.
2. Because its height doesn't change, where potential energy is directly proportional to height. (P.E. = w × h)

4 A. 1. Potential energy = Weight × Height
88 = Weight × 11
Weight = $\frac{88}{11}$ = 8 newton
2. Force = $\frac{\text{Work}}{\text{Displacement}} = \frac{20}{5} = 4$ newton

B. Fig. (2), because the boy affects on the car by his muscular force and this force transfers the car for a distance in the same direction of its effect.

Worksheet 12

1 A. 1. The work done during the motion of the object is 50 joule.
2. The energy stored in the object due to the work done on it is 30 joule.
3. The sum of potential and kinetic energies of the object is 100 joule.

B. 1. Mechanical energy
= Potential energy + Kinetic energy
= 500 + 1000 = 1500 joule.
2. - Potential energy at 7 m
= Weight × Height
= 5 × 7 = 35 joule.
- Kinetic energy at speed of 8 m/sec.
= $\frac{1}{2}$ × Mass × $(\text{Speed})^2$
= $\frac{1}{2}$ × 0.5 × $(8)^2$ = 16 joule.
- Work done
= Potential energy + Kinetic energy
= 35 + 16 = 51 joule.

2 A. 1. b 2. a
B. 1. (✓) 2. (✗)

3 1. Work = Force × Displacement.
2. Potential energy = Weight × Height.
3. Kinetic energy = $\frac{1}{2}$ × Mass × $(\text{Speed})^2$
4. Mechanical energy
= Potential energy + Kinetic energy.

4 A. 1. (A) – (C) 2. (B) 3. zero
4. The mechanical energy at (A)
= Potential energy at maximum height
= Weight × Height from the ground
= 5 × 4 = 20 joule.

B. Because the kinetic energy of a moving body is directly proportional to the square of its speed.

Worksheet 13

1 A. 1. chemical – electric
2. potential – kinetic
3. copper – zinc. 4. kinetic – potential

B. 1. Simple electric cell.
2. (1) Copper plate. (2) Zinc plate.
(3) Dil. sulphuric acid.
(4) Glass container (5) Lamp.

3. It converts the chemical energy into electric energy.

2 A. 1. The lamp lights due to an electric current is produced.
2. When the pendulum passes its rest position, its speed is maximum, while when it reaches the maximum height, its speed is zero.

B. 1. c 2. c

3 1. a. Potential energy at 4 metres = Weight × Height
= 5 × 4 = 20 joule.
b. Kinetic energy = $\frac{1}{2}$ × Mass × $(\text{Speed})^2$
= $\frac{1}{2}$ × 0.5 × 10 × 10 = 25 joule.
Mechanical energy = P.E. + K.E.
= 20 + 25 = 45 joule.
Work done on the ball at the starting point = mechanical energy = 45 joule.
c. At maximum height :
The mechanical energy = Potential energy
= Weight × Height
45 = 5 × Height
Maximum height = $\frac{45}{5}$ = 9 metres.

2. a. Kinetic energy at the highest point = zero.
b. • Potential energy at the highest point
= $\frac{1}{2}$ Mechanical energy = w × h = 5 × 20
= 100 joule
• Kinetic energy at midpoint
= $\frac{1}{2}$ mechanical energy
= $\frac{1}{2}$ × 100 = 50 joule.

4 A. 1. The needle of the compass deflects indicating that an electric current flows through the circuit.
2. The electric current will be produced and the compass needle will deflect.

B. Because in both of them, the potential energy and kinetic energy are interchanged without ending and the sum of such energies (mechanical energy) at any moment is constant.

C.

Position	K.E.	P.E.
(A)	0	150
(B)	100	50
(C)	0	150

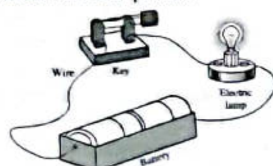
Worksheet 14

1 **A.** 1. – Because some of them cause environmental pollution as :
- electromagnetic pollution.
- noise pollution.
- chemical pollution of air , water and soil.

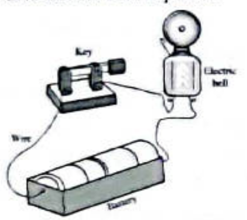
– In addition to when man used them in :
- wars and killing.
- massive destruction.

2. Because some of these applications have negative effects on the environment.

B. 1. A tool for a deaf person.



2. A tool for a blind person.



2 1. Light & heat 2. Electric 3. Heat 4. Chemical 5. Kinetic

3 1. It causes chemical pollution of air.
2. They cause the massive destruction.
3. They cause chemical pollution of soil, water and air and hence cause cancer and food poisoning.

4 **A.** 1. c 2. c 3. d 4. a 5. a

B. 1. The law of conservation of energy.
2. Electromagnetic pollution.

Worksheet 15

1 1. joule – newton.
2. mass – speed of the body.
3. electric – sound
4. potential – kinetic

2 **A.** 1. a 2. a 3. c

B. 1. Due to increasing its kinetic energy as the kinetic energy of a moving body is directly proportional to its mass.
2. Due to the production of the electric current, as the potato has a salt solution that has the same effect of the acidic solution of lemon in completing the reaction.

3 **A.** 1. (✓) 2. (✗) 3. (✓) 4. (✗) 5. (✗)

B. 1. It produces energy that enables the body to carry out various activities and do work.
2. The potential energy doesn't change.
3. They cause chemical pollution of soil, water and air and hence cause cancer and food poisoning.

4 **A.** Energy is neither created nor destroyed, but it is converted from one form to another.

B. • Weight of the object.
• Height of the object from the ground.

Worksheet 16

1 **A.** 1. conduction – convection – radiation.
2. increases – thermometer.

B. 1. Heat energy.
2. The transfer of heat by conduction.

2 1. c 2. b 3. d

3 **A.** Because they are good conductors of heat and they have high melting points.

B. – At area (A) heat transfers by convection and radiation.
– At area (B) heat transfers by conduction.
– At area (C) heat transfers by convection and radiation.

4 **A.** It is the heat condition which determines the direction of heat energy whether from or to the object when it comes in contact with another.

B. 1. object (A) – object (B)
2. the temperatures of them become equal.

Worksheet 17

1 1. Because when the air (around the heater) is heated, its density decreases so it rises up to warm the room, while the cold air falls down to be heated again and so on.
2. Because solar energy is a clean source of energy which doesn't pollute the environment and it is a permanent source of energy, while fuel pollutes the environment and it is a non-renewable source of energy.
3. Because the transfer of heat by radiation doesn't need any material medium through which heat transfers.
4. Because solar heater doesn't pollute the environment and it depends on the Sun which is a permanent and cheap resource of energy.

2 **A.** 1. d 2. c 3. b 4. a

B. Fig. (1) Heat is transferred by convection and radiation.

Fig. (2) Heat is transferred by conduction [from the flame to liquid through the glass of the beaker] and convection [inside the liquid].

3 **A.** 1. The transfer of heat by convection.
2. The transfer of heat by radiation.

B. 1. Electricity – natural gas
2. Electric heater – solar heater – electric stove
3. convection – radiation.

4 **A.** *Look at the main book on page (153).*

B. 1. It changes the solar energy into heat energy.
2. It changes the solar energy into electric energy.

General Exercise of the School Book on Unit Two

1 1. c 2. c 3. b 4. b 5. a 6. c 7. d 8. b

2 1. This means that the energy stored in the object due to the work done on it is 20 joule.
2. This means that the work done during the motion of the object is 20 joule.
3. This means that the sum of potential and kinetic energies of the object equals 100 joule.
4. It is a form of energy which is transferred from the object of higher temperature to that of lower temperature.

3 1. Because when air is cooled, its density increases, so it falls down to cool the food in the fridge and the hot air rises up to be cooled again and so on.
2. Because when air (around the heater) is heated, its density decreases, so it rises up to warm the room, while the cold air falls down to be heated again and so on.
3. Because burning each of them produces energy makes the car moves (do work) and the living organism makes its vital processes (do work).
4. Because nuclear stations don't pollute the environment, while petrol stations pollute the environment.
5. Because some of the technological applications have negative effects on the environment.

4 *Look at the main book on page (133).*

5 1. Weight = Mass × Acceleration due to gravity
= 5 × 10 = 50 N.
Pot. energy = Weight × Height
= 50 × 8 = 400 joule.
Kinetic energy = zero
2. Pot. energy = Weight × Height
= 50 × 2 = 100 joule.
Mechanical energy = Pot. energy at the maximum height = 400 joule.
Kinetic energy =
Mechanical energy – Pot. energy
= 400 – 100 = 300 joule.
3. Pot. energy = zero
Kinetic energy = Mechanical energy
= 400 joule

6 Weight $= \frac{\text{Pot. energy}}{\text{Height}} = \frac{88}{11} = 8$ N.

7 $\frac{1}{2}$ Mass $= \frac{\text{K.E.}}{(\text{Speed})^2} = \frac{64}{(4)^2} = 4$ kg

Mass = 4 × 2 = 8 kg

Model Exam 1 on Unit Two

1 **A.** 1. c 2. c 3. a 4. a

B. 1. Mechanical energy.
2. Transfer of heat by radiation.
3. The law of conservation of energy.
4. Kinetic energy.

C. Because the friction between the bike tire and the brakes converts the mechanical energy into heat energy.

2 A. 1. a battery – an electric lamp
2. electric – kinetic
3. Fuel – light energy
4. decreases – upwards

B. 1. c 2. a 3. b 4. e

C. Its potential energy is doubled.

3 A. 1. solar 2. noise pollution.
3. convection. 4. 40 joule.

B.

The odd word	The scientific term
1. Heat energy	– Resources of energy.
2. Mass	– Pot. energy = Weight × Height.
3. Friction	– Ways of heat transfer.
4. Coal heater	– Technological applications don't pollute the environment.

C. ***Look at the main book on page (155).***

4 A. 1. (✗) Cold air falls down, but hot air rises up.
2. (✓) 3. (✗) .... doesn't change.
4. (✓)

B. 1. Simple electric cell.
2. (1) Zinc plate.
(2) Copper plate.
(3) Dil. sulphuric acid.
3. chemical – electric

C. B – C – A – D
Because the potential energy is directly proportional to the height of the object.

Model Exam 2 on Unit Two



1 A. 1. (✗) Weight of the object = ...
2. (✗) .... electric energy.
3. (✗) .... its density decreases, so it rises up.
4. (✗) The Sun is ....

B. 1. d 2. c 3. e 4. b

C. Because when air is cooled, its density increases, so it falls down to cool the food in the fridge and the hot air rises up to be cooled again and so on.

2 A. 1. convection – radiation.
2. kinetic – electric
3. conduction – convection
4. Potential energy – Kinetic energy.

B. 1. Electromagnetic pollution.
2. Energy. 3. Work.
4. Temperature.

C. 1. The needle of the compass will deflect due to the production of the electric current.
2. No electric current will be produced.

3 A. 1. c 2. b 3. d 4. d

B.

The odd word	The scientific term
1. Sun	– Non-renewable resources of energy.
2. Solar battery	– Technological applications convert the solar energy into heat energy.
3. Weight	– Kinetic energy = $\frac{1}{2}$ mass × (speed)^2.
4. Weight	– Resources of energy.

C. Energy is neither created nor destroyed, but it is converted from one form to another.

4 A. 1. convection. 2. 25 joule.
3. weight 4. zinc

B. 1. Non-polluting the environment.
2. Polluting the environment.

C. 1. The weight (X), because it has the highest weight and is located at position higher than the others as the potential energy is directly proportional to the weight and the height of the object.
2. The weight (Y), because it has the lowest mass and the nearest weight to the ground, so it has the least speed as the kinetic energy is directly proportional to the mass and square of speed of the object.

Worksheet 18

1 1. Amoeba – euglena – paramecium
2. banana plant – molukhiyah plant.
3. Methylene blue

2 Many living micro-organisms can be seen and most of them are unicellular organisms such as amoeba, euglena and paramecium.

3 1. b 2. c 3. b

4 A. 1. Due to enormous diversity in living organisms species, so they must be classified into groups to facilitate their study.
2. Because banana plant carries large-sized leaves, while molukhiyah plant carries small-sized leaves.

B. They are living organisms that can't be seen by naked eye, but they spread every where around us, (in air, water and soil).

Worksheet 19

1 1. • **Insects :** have 3 pairs of jointed legs.
• **Arachnids :** have 4 pairs of jointed legs.
2. • **Bean plant :** is a dicotyledon plant.
• **Maize plant :** is a monocotyledon plant.

2 1. d 2. c 3. d
4. b 5. b 6. a

3 A. 1. monocotyledon – dicotyledon
2. Vougheir – pine

B. 1. Algae. 2. Ferns. 3. Vertebrates.

4 1. Numerous legs. 2. Four pairs. 3. Three pairs.

5 A. 1. Bean plant. 2. Mussel.
3. Green alga. 4. Earthworm.
5. Adiantum. 6. Pine plant.

B. Because it has 4 pairs of jointed legs, but insects have 3 pairs of jointed legs.

Worksheet 20

1 A. To capture insects.

B.

The odd word	The scientific term
1. Spider.	Insects.
2. Snake.	Micro-organisms.
3. Octopus.	Animals with support.

2 1. Sloth – armadillo 2. Species
3. rodents – lagomorphs

3 1. It is a group of more similar living organisms in shape that can reproduce to give birth of new fertile individuals which are able to reproduce and keep the existence of the species.
2. It is a branch of biology that searches for the similarities and the differences among living organisms and it places the similar ones in groups according to a certain system in order to ease their study.

4 1. It has sharp incisors, two pairs of incisors in the upper jaw and one pair in the lower jaw.
2. It has sharp incisors, one pair of incisors in each jaw.
3. It has front teeth extending outwards to capture insects.
4. It has pointed canines and molars with sharp projections.

5 1. Sloth is from teethless mammals.
2. Spider is from arachnids that have four pairs of jointed legs.
3. Scolopendra is from myriapods that have numerous number of jointed legs.
4. Pine plant is from gymnosperms that their seeds are formed inside cones.
5. Cow (mammal) is from animals with an internal support.
6. Jellyfish is from animals which have soft body.
7. Euglena is from micro-organisms.
8. Desert snail is from animals with an external support.
9. Lion is from animals which have pointed canines and molars with sharp projections.
10. Bee is from insects that have three pairs of jointed legs.

Worksheet 21

1 A. 1. Functional adaptation.
2. Behavioural adaptation.

B. – To get food from the surrounding environment.
– To escape from enemies in dangerous situations.
– To move in different environments.

2 A. 1. functional – behavioural.
2. strong solid hoof – thick flat pad
3. paddles – swimming – wings – flying
4. strong and sharp crooked – wide indented
5. mosses – fish
6. Hawks – vultures – meat.

B. 1. a 2. c 3. d 4. c
5. a 6. b 7. b

3 **A.** 1. It is a modification of a living organism's behaviour or its body structure , or even the biological functions of its organs to become more adapted to the environmental conditions where it lives in.

2. It is a modification in the structure of one of body organs of a living organism to cope with the environmental conditions.

B. 1. To enable it to climb trees and catch objects.

2. Due to the modification of front limbs to suit the way of movement, where in dolphin they are modified into paddles to perform the function of swimming and diving, while in bat they are modified into wings to perform the function of flying.

3. Long thin beaks to help them picking up worms and snails, and long thin legs ending with thin toes to help them walk in the existence of water.

4 **A.** 1. To help them in swimming.

2. To control pouncing the prey.

B.

Animal	(1)	(2)	(3)	(4)
Motion	(b) Swimming	(a) Climbing	(d) Running	(c) Flying

C. 1. Some adaptations took place in mammals limbs to suit the way of movement.

2. Their beaks are modified to several shapes.

Worksheet 22

1 1. To absorb the nitrogenous substances that their bodies need.

2. To overcome the decrease in temperature.

3. To reproduce in more lighted and warmer regions.

4. To be hidden from its preys of insects to capture them and feed on them.

2 **A.** 1. b 2. b 3. a 4. a

B. ***Look at the main book on pages (199 , 200).***

3 1. Dioneea – drosera – halophila

2. hibernation – aestivation. 3. behavioural

4. Aestivation – hibernation – birds migration

5. burrows.

6. Leaf insect – stick insect – chameleon

4 **A.** It is the ability of some living organisms to be hidden from their enemies or to capture the preys in the predatory species.

Example : Stick insect looks like the branches of plants.

B. It is easily to be discovered by its enemies.

General Exercise of the School Book on Unit Three

1 1. Amoeba – euglena 2. one pair – two pairs.

3. edentates – teethed

4. Vougheir – pine

2 1. a 2. a 3. c 4. c 5. c

3 1. • **Insects** have 3 pairs of jointed legs. [Ex.: Ant]

• **Arachinds** have 4 pairs of jointed legs. [Ex.: Spider]

2. • **Rodents** have one pair of incisors in each jaw. [Ex.: Rat]

• **Lagomorphs** have 2 pairs of incisors in the upper jaw and one pair in the lower one. [Ex.: Rabbit]

3. • **Bean plant** is a dicotyledon plant.

• **Maize plant** is a monocotyledon plant.

4 1. Because each of them has its specific shape.

2. To overcome the decrease in temperature.

5 1. It will die because it can't tolerate the extreme cold.

2. They will die, because they don't obtain the enough food during aestivation.

3. Hoopoe feeds on meat and hawk feeds on worms and snails.

4. They cannot make their needed proteins.

6 1. Its beak is wide indented in the two sides to help it filter the food from water.

2. Its beak is long thin to pick up worms and snails.

3. Its front teeth are extending outwards to capture insects.

4. Some parts of its leaves are adapted and modified to pounce and digest insects to get the needed protein.

7 1. Some adaptations took place in mammals limbs to suit the way of movement.

2. Putting taxonomic plans of classification of living organisms.

Model Exam 1 on Unit Three

1 **A.** 1. Hibernation

2. Secreting poison in snakes

3. Maize – wheat – bean

4. Paddles.

5. cilia – pseudopods.

B. 1. c 2. e 3. a 4. b

C. Its colour changes to yellow to hide in the environment.

2 **A.** 1. d 2. a 3. c 4. b

B. 1. (x) ______ has an internal support and an external support.

2. (✓)

3. (x) Rat, squirrel and jerboa ______

4. (x) Some reptiles hibernate in winter ______

C. Because it makes aestivation in summer as it hides in humid burrows.

3 **A.** 1. unicellular 2. Taxonomy

3. structural adaptation. 4. Dieonea

B. 1. Species. 2. Aestivation.

3. Micro-organisms. 4. Camouflage.

C.

Angiosperms	Gymnosperms
They are flowering plants that their seeds are formed inside a pericarp.	They are non-flowering plants that their seeds are formed inside cones and not inside a pericarp.

4 **A.**

The odd word	The scientific term
1. Vougheir	- Plants reproduce by formation of seeds.
2. Elodea	- Insectivorous plants.
3. Armadillo	- Mammals having teeth.
4. Ducks	- Predatory birds.

B. 1. The number of pairs of jointed legs in arachnids.

2. The number of pairs of jointed legs in insects.

C. It is a modification in some tissues and organs of the body of a living organism to become able to do specific functions.

Model Exam 2 on Unit Three

1 **A.** 1. d 2. a 3. c 4. d

B. 1. Vougheir plant

2. Jerboa 3. Julius 4. camel.

C. A sterile female called mule is produced.

2 **A.** 1. sloth – armadillo.

2. insects – arachnids – myriapods.

3. paddles – swimming and diving in water.

4. Leaf

B.

The odd word	The scientific term
1. Elodea plant	Animals do camouflage.
2. Dinosaur	Animals do behavioural adaptation.
3. Fish	Animals with external support
4. Spider	Insects

C.

Rabbit	Squirrel
It has two pairs of incisors in the upper jaw and one pair in the lower jaw.	It has one pair of incisors in each jaw.

3 **A.** 1. Species.

2. Camouflage.

3. Taxonomy.

4. Hibernation.

B. 1. c 2. a 3. d 4. b

C. To capture insects.

4 **A.** 1. (✓) 2. (✓) 3. (✓)

4. (x) ______ make proteins.

B. 1. amoeba – paramecium.

2. pseudopods – cilia

C. 1. Structural adaptation.

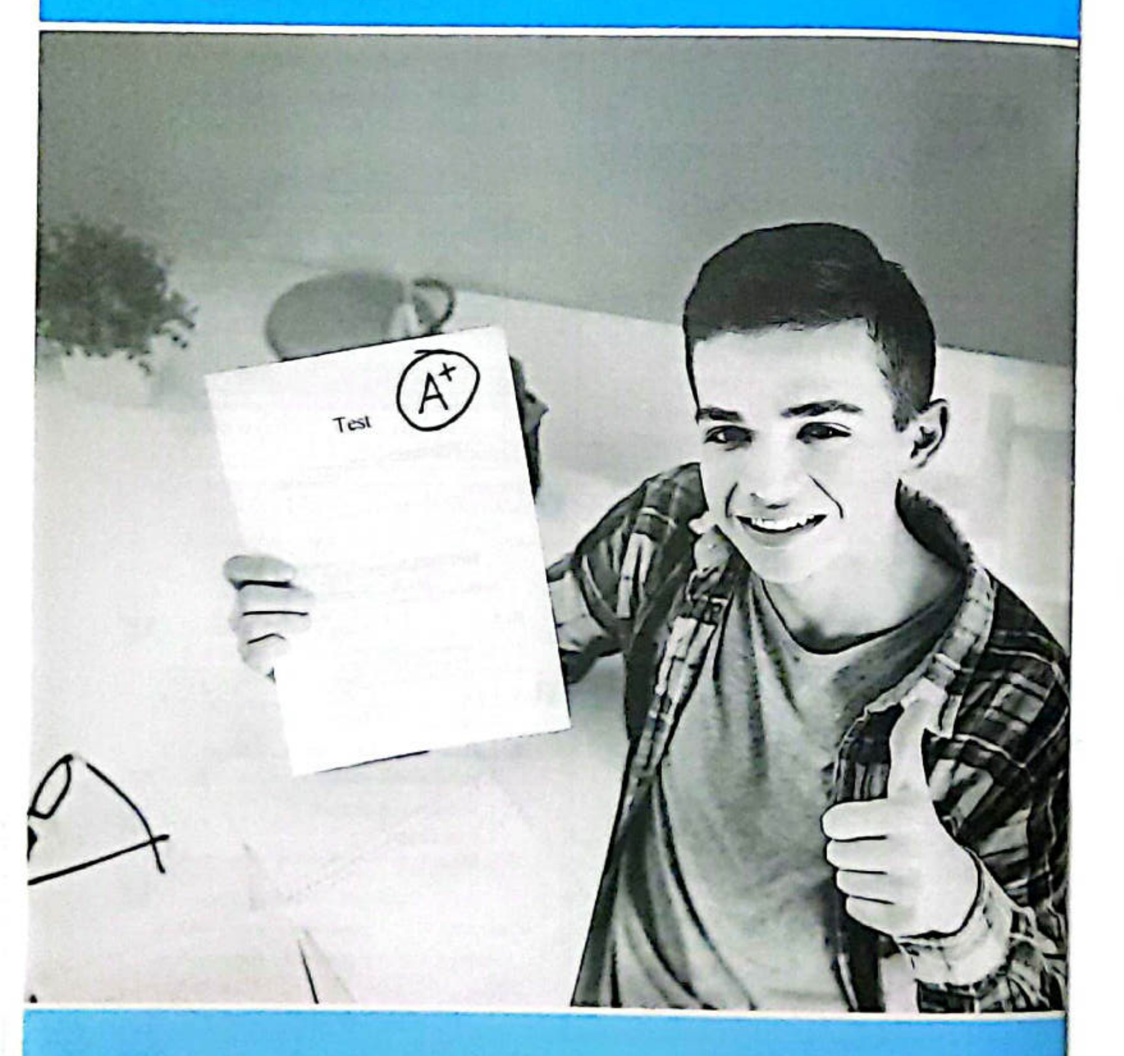
2. Four fingers.

3. Meat.

PART

3

Guide Answers of Final Examinations



Cairo Governorate

1 St.Joseph School

1 (A) 1. Because the hardness of iron is more than that of copper.

2. Because the symbol is derived from Latin name, so that the symbol of this element differs from its name in English language.

3. Because at the maximum height, the speed of the object equals zero.

4. Due to the enormous diversity in living organisms species, so they must be classified into groups to facilitate their study.

(B) 1. 8   2. (1), (3)   3. heat

4. Behavioural adaptation

(C) 1. The mechanical energy changes into heat energy by friction.

2. The odour of the perfume spreads all over the room.

2 (A) 1. c   2. c   3. b   4. c

(B) 1. Elephant.

2. Molukhiyah plant.

(C) 1. solid   2. Melting

3. Evaporation   4. Gaseous

3 (A)

Odd word	Scientific term
1. $_2$He	- Solid metals.
2. Bird	- Animals with soft bodies.
3. Sugary solutions	- Good conductors of electricity.
4. A piece of iron	- Substances that have low densities than that of water.

(B) 1. K L (2, 8)

2. K L M

3. K L M N (2, 8, 8, 2)

4. K (1)

(C) 1. The mass of one cubic centimetre ($1 cm^3$) of water is 1 gm.

2. The water begins to change into water vapour at 100°c

3. The work done during the motion of the object is 40 joule.

4 (A) 1. Matter.   2. Energy.

3. Micro-organisms.

4. Molecule.

5. Mechanical energy

(B) 1. a. N   b. Ar   c. Fe

2. Atomic number = 8

Mass number = 16

The symbol $^{16}_{8}O$

(C) $D = \frac{M}{V} = \frac{78}{10} = 7.8\ gm/cm^3$

2 Leaders Language Schools

1 (A) 1. copper-gold – nickel-chrome

2. Vougher – adiantum

3. indefinite – definite

4. protons – neutrons

(B) 1. (✗) ___ by conduction.

2. (✓)

3. (✗) ___ similar

4. (✗) ___ 4 atoms ___

(C) $K.E = \frac{1}{2} \times mass \times (speed)^2$

$= \frac{1}{2} \times \frac{500}{1000} \times (30)^2$

$= 225$ joule.

2 (A) 1. d   2. a   3. c   4. b

(B) 1. Insectivorous plants.

2. Rodents.   3. Noble gases.

4. Evaporation.

(C)

P. O. C.	Electrons	Protons
1. Charge :	Negative ⊖	Positive ⊕
2. Position :	Revolve around the nucleus.	In the nucleus.

3 (A) 1. Because the number of negative electrons which revolve around the nucleus is equal to the number of positive protons in the nucleus.

2. Because the molecules of the perfume are in a continuous motion and they keep the properties of the perfume.
3. Because wind energy is a cheap and clean resource of energy as it doesn't pollute the environment.
4. To perform the function of climbing trees and catching things.

(B) 1. Friction. 2. Petrol stove.
3. Aluminium. 4. Sodium.

(C) 1. To pick up worms and snails.
2. To help them in swimming.

4 (A) 1. The petrol floats on water surface, so the fires don't put out.
2. It transfers to a higher energy level and the atom becomes excited atom.
3. It can't capture its preys for feeding and it may be seen by its enemies which prey it.
4. They will be classified as arachnids.

(B) 1. Camphor.
2. Rhinoceros.
3. Pine plant.
4. Solar heater.

(C) 1. K L M N (2 8 8 1)

Type : very active metal.

2. K L (2 8)

Type : Noble gas

3 Mokattam Language International School

1 (A) 1. One – two
2. potential – kinetic
3. kinetic – electric
4. height – weight

(B) 1. Fish. 2. Copper.
3. Mercury.

(C) It is the number of protons in the nucleus of an atom.

2 (A) 1. Protons.
2. Potential energy.
3. Camouflage.
4. Transfer of heat by conduction.
5. Boiling point.
6. Taxonomy.

(B) 1. Mechanical energy changes into heat energy by friction.
2. The colour of ink spreads through all the water.
3. It rusts due to its reaction with atmospheric oxygen.

(C) The volume of the iron piece = The volume of water and the piece of iron – The volume of water = 110 – 100 = 10 cm^3

$\therefore D = \frac{M}{V} = \frac{78}{10} = 7.8$ gm/cm^3

3 (A) 1. (✗) ...... the sum of numbers of protons and neutrons.
2. (✗) ...... by convection and radiation.
3. (✓)
4. (✓)
5. (✓)
6. (✗) ...... are very active metals.

(B) 1. K L M (2 8 8)

2. K L (2 5)

3. K L M (2 8 7)

(C) 1. Because the transfer of heat by radiation doesn't need any material medium through which heat transfers.
2. To capture insects.

4 (A) 1. c 2. a 3. d 4. a 5. b
6. c 7. d 8. c

(B) 1. O 2. Cu 3. Fe 4. H

(C) 1. Insects ⟶ 3 pairs of jointed legs.
Arachnids ⟶ 4 pairs of jointed legs.
2. Solids ⟶ very strong intermolecular forces.
Gases ⟶ very weak intermolecular forces.

4 Al-Ola Language Schools

1 (A) 1. b 2. b 3. a 4. b

(B)

Odd word	Scientific term
1. Oxygen	- Noble gases.
2. Water	- Elements.
3. Electric fan	- Sources of heat energy.
4. Pine	- Angiosperms.

(C) Because the density of wood is less than that of water, while the density of cork is less than that of water.

2 (A) 1. (✓) 2. (✗) 3. (✗) 4. (✗)

(B) 1. Potassium. 2. Rubber.
3. Banana plant. 4. Sloth.

(C) An electric current flows through the wire.

3 (A) 1. Element. 2. Atomic number.
3. Work. 4. Algae.

(B) 1. two – one
2. External shape – way of reproduction.

(C)

P.O.C.	Angiosperms	Gymnosperms
1. Definition :	They are flowering plants that their seeds are formed inside a pericarp.	They are non-flowering plants that their seeds are formed inside cones and not inside a pericarp.
2. Example :	Maize plant.	Pine plant.

4 (A) 1. e 2. d 3. b 4. c

(B) 1. Na 2. Ca
3. Al 4. Cl

(C) 1. To perform the function of swimming and diving in water.
2. To perform the function of flying.

5 Alfarouk Islamic Language School

1 (A) 1. mechanical – heat
2. rust and corrosion.
3. motion. 4. K – Au
5. elongated bones of front limbs
6. 7

(B) 1. To overcome extreme rise in temperature and shortage of water and rains.
2. Because the intermolecular spaces among their molecules are very narrow and the intermolecular force is very strong.

(C) 1. d 2. f 3. b 4. a

2 (A) 1. b 2. a 3. d 4. a
5. d 6. b 7. d 8. c

(B) Weight = mass × acceleration due to gravity

W = m × g = 55 × 10 = 550 N

P.E = weight × height

= 550 × 4 = 2200 Joule

(C)

Odd word	Scientific term
1. Air	- Elements.
2. Julius	- Insects.
3. Pine	- Angiosperms.
4. Sloth	- Mammals having teeth.

3 (A) 1. chemical
2. Hydrogen chloride 3. proteins.
4. Copper-gold 5. ducks
6. 2 7. Sodium 8. Amoeba

(B) It is a group of more similar living organisms in shape that can reproduce to give birth of new fertile individuals, that are able to reproduce and keep the existence of the species.

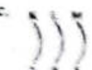
(C) 1. Electric fan.
2. Secreting poison in snakes
3. Mercury. 4. Mussel

4 (A) 1. Kinetic energy
2. Taxonomy. 3. Camouflage.
4. The compound. 5. Melting point.
6. Joule. 7. Quantum.
8. Adaptation.

(B) It sinks in water, because its density is more than that of water.

(C) 1. a. 16 b. 15

c.



2. It is an active element.

6 Manaret El-Eman Language School

1 (A) 1. Melting point.
2. Intermolecular spaces.
3. Energy.
4. Transfer of heat by conduction.

(B) 1. Because the densities of hydrogen and helium are less than the density of air.
2. Because it contains protons which are positively charged and neutrons which are electrically neutral.
3. Because when air is cooled, its density increases, so it falls down to cool the food in the refrigerator and the hot air rises up to be cooled a gain and so on.
4. Because it is from unicellular organisms that can be seen only by the microscope.

(C) a. $^{35}_{17}Cl$ b. $^{16}_{8}O$
1. The number of neutrons :
a. 18 b. 8
2. a & b are active elements because their outer most energy levels contain less than 8 electrons.

2 (A) 1. paddles – swimming and diving.
2. mercury – bromine.
3. sloth – armadillo.
4. copper-gold – nickel-chrome.

(B) 1. The colour of ink spreads through all the water.
2. The mechanical energy changes into heat energy by friction.
3. It transfers to a higher energy level (M) and the atom becomes excited atom.
4. They cannot make their needed proteins.

(C) P.E. = weight × height
$W = \frac{P.E.}{H} = \frac{88}{11} = 8$ N.

3 (A) 1. (✗) ...... similar
2. (✗) ...... and neutrons.
3. (✗) ...... behavioural adaptation.
4. (✓)

(B) 1.

P.O.C.	Insects	Arachnids
No. of jointed legs :	3 pairs.	4 pairs.
Examples :	Locusts and bees.	Spiders and scorpions.

2.

P.O.C.	Potential energy	Kinetic energy
Definition	It is the energy stored in the object due to the work done on it.	It is the work done during the motion of an object.
Factors affecting it :	• Weight of the object. • Height of the object from the ground.	• Mass of the object. • Speed of the object.
Law used :	Potential energy = Weight × Height.	Kinetic energy = $\frac{1}{2}$ × Mass × $(Speed)^2$.

3. - Sodium : is a very active metal.
- Gold : is an inactive metal.
4. - Protons : are positively charged particles.
- Electrons : are negatively charged particles.

(C) 1. Dieonea.
2. Jellyfish.

4 (A) 1. c 2. c 3. c 4. d

(B) 1. - Fish : It has an internal support.
- Desert snail : It has an external support.
2. - Helium : Monoatomic molecule.
- Hydrogen : diatomic molecule.
3. - Element : consists of similar atoms.
- Compound : consists of different atoms.
4. - Transfer of heat by convection : through liquids (need medium).
- Transfer of heat by radiation : through space (doesn't need medium).

(C) 1. To enable it to climb trees and catch things.
2. To tear the prey's flesh.

Giza Governorate

7 Modern Narmer Language School

1 (A) 1. kinetic – potential.
2. bromine – mercury.
3. quantum.
4. conduction – convection.
5. wings.

(B) 1. Electric simple cell.
2. (1) Copper plate.
(2) Zinc plate.
3. An electric current flow through the wire.

(C) 1. Ca 2. Ag 3. K 4. Fe 5. Hg 6. C

2 (A) 1. Protons.
2. Melting point.
3. Molecule.
4. Potential energy.

(B) K.E = $\frac{1}{2}$ × mass × $(speed)^2$
= $\frac{1}{2} \times 6 \times 16$
= 48 joule.

(C) 1. d 2. f 3. e 4. b 5. a

3 (A) 1. Silicon. 2. Copper.
3. Hydrogen. 4. Zinc.
5. Sodium.

(B) 1. Because the number of negative electrons which revolve around the nucleus is equal to the number of positive protons in the nucleus.
2. To tear their prey's flesh.
3. Because when air around the heater is heated, its density decreases so it rises up to warm the room. While the cold air falls down to be heated again and so on.
4. Because the mass number is the sum of numbers of protons and neutrons inside the nucleus, while atomic number equals the number of protons only.

(C) 1. It is the ability of some living organisms to be hidden from their enemies or to capture the preys in the predatory species.
2. It is a substance which is formed from the combination of atoms of two or more different elements with constant weight ratios.

4 (A) 1. c 2. a 3. b 4. c 5. d

(B) $D = \frac{M}{V} = \frac{164}{200} = 0.82$ gm/cm^3

(C)

	1. $^{16}_{8}O$	2. $^{35}_{17}Cl$	3. $^{40}_{20}Ca$
a. Electronic configuration :	K L: 2 6	K L M: 2 8 7	K L M N: 2 8 8 2
b. The number of energy levels :	2	3	4

8 6th October Directorate

1 (A) 1. weight of an object – height.
2. one – two
3. salty solutions – acidic
4. Sun
5. copper-gold – nickel-chrome
6. Light – electric

(B) 1. Because the number of negative electrons which revolve around the nucleus is equal to the number of positive protons in the nucleus.
2. To help them to filter the food from water.

(C) 1. K 2. Fe 3. C 4. O

2 (A) 1. b 2. b 3. c 4. a
5. a 6. a

(B) 1. It is the simplest pure form of matter which can't be analyzed chemically into simpler form by simple chemical methods.
2. It is the sum of potential and kinetic energies of the body.

(C) 1. Rubber. 2. Copper.
3. Potassium. 4. Insects (bees).

3 (A) 1. Melting point. 2. Arthropods.
3. Kinetic energy. 4. Adaptation.
5. Excited atom. 6. Mass number.

(B) 1. 2.

(C) D = $\frac{M}{V}$ = [illegible] = 7.8 gm/cm^3

1 (A) 1. (✗) Hot .... cold ....

2. (✓)

3. (✗) .... electromagnetic pollution.

4. (✓) 5. (✓)

6. (✓)

(B)

P.O.C.	Solid	Gas
1. Intermolecular space :	Very small (narrow).	Very large.
2. Examples :	- Ice - Iron and Aluminium	- Water vapour. - Oxygen and carbon dioxide.

(C) $K.E = \frac{1}{2} \times mass \times (speed)^2$

$= \frac{1}{2} \times 0.5 \times (3)^2$

$= 2.25$ joule

P.E = weight × height

$= 5 \times 4$

$= 20$ joule

9 Egypt Dream Language School

1 (A) 1. a 2. a 3. c 4. d

(B) a. Potassium.

b. Mass number = 39

c. The number of neutrons

= Mass no. – Atomic no. = 39 – 19 = 20

d. The number of electrons in the outer level = 1

(C) P.E = weight × height

$= 20 \times 5 = 100$ joule.

2 (A) 1. Because it has four pairs of jointed legs, while insects have three pairs of jointed legs.

2. Because it contains protons which are positively charged and neutrons which are electrically neutral.

3. Because when air is cooled, its density increases, so it falls down to cool the food in the refrigerator and hot air rises up to be cooled again and so on.

4. Because they are good conductors of heat and they have high melting point.

(B) 1. Helium. 2. Solar cell.

3. Rubber. 4. Frogs.

(C) 1. $^{40}_{20}Ca$ K L M N : 2 8 8 2 2. $^{32}_{16}S$ K L M : 2 8 6

3 (A) 1. Na – N

2. light – chemical

3. copper – zinc

4. Amoeba – paramecium

(B) 1. Q level. 2. Quantum.

3. Gm/cm^3 4. Taxonomy.

(C) 1. Aluminium 2. Sugar solution.

4 (A) 1. Neutrons 2. potential energy

3. copper and gold 4. convection

(B) 1. 2 2. 2

3. 4 4. Inactive

(C) 1. Behavioural adaptation.

2. Functional adaptation.

10 North Giza Directorate

1 (A) 1. protons – neutrons.

2. paddles – wings.

3. jewels – heating coils.

4. conduction – convection.

(B) 1. The heat transfers from the hot object to the cold object until their temperatures become equal.

2. It transfers to a higher energy level and the atom becomes excited atom.

3. The nucleus of an atom of an element doesn't contain neutrons.

4. Its kinetic energy equals zero, while its potential energy is maximum.

(C) 1. It is the smallest part of matter which can exist freely and it has the properties of matter.

2. It is a branch of biology that searches for the similarities and the differences among living organisms and it places the similar ones in groups according to a certain system in order to ease their study.

2 (A) 1. Salty solution 2. Electricity

3. Vougheir 4. Helium

(B) 1. pad. 2. Rubber

3. Snails 4. Solids.

(C) 1. Hg 2. Na

3 (A) 1. - Hedgehog : mammal has teeth.

- Sloth : mammal doesn't have teeth.

2. - Gold : an inactive metal.

- Potassium : a very active metal.

3. - Element : consists of similar atoms.

- Compound : consists of different atoms.

4. - Simple cell : changes chemical energy into electric energy.

- Solar cell : changes light energy into electric energy.

(B) 1. Species. 2. Energy levels.

3. Boiling point. 4. Density.

(C) Weight = mass × acceleration due to gravity

$= 5 \times 10 = 50$ N

P.E = Weight × height

$= 50 \times 4$

$= 200$ joule.

4 (A) 1. Because the number of negative electrons which revolve around the nucleus is equal to the number of positive protons in the nucleus.

2. Because spider has four pairs of jointed legs, while ant has three pairs of jointed legs.

3. Because when air is cooled, its density increases, so it falls down to cool the room and the hot air rises up to be cooled again and so on.

4. Because the density of iron is more than that of water, while the density of wood is less than that of water.

(B) 1. c 2. a 3. b 4. c

(C) 1. K L M : 2 8 2 2. K L M N : 2 8 8 2

Alexandria Governorate

11 Taymour English School

1 (A) 1. The intermolecular spaces.

2. The law of conservation of energy.

3. Activation.

4. Friction.

5. Energy levels.

6. Transfer of heat by radiation.

7. Sun.

(B) 1. Gymnosperms.

2. Animals with soft bodies.

(C) $Density = \frac{Mass}{Volume}$

$M = D \times V = 4.5 \times 3 = 13.5$ gm

2 (A) 1. Because the number of negative electrons which revolve around the nucleus is equal to the number of positive protons in the nucleus.

2. Because when air around the heater is heated, its density decreases so it rises up to warm the room, while the cold air falls down to be heated again and so on.

3. Because the density of petrol is less than that of water so, petrol floats on water surface and water doesn't put out the petrol fires.

4. To absorb the nitrogenous substances that their bodies need to make protein.

(B) Weight = mass × acceleration due to gravity.

$= 0.25 \times 10 = 2.5$ N

a. $P.E = w \times h = 2.5 \times 6 = 15$ joule

$K.E = 0$

$M.E = P.E + K.E = 15$ joule

b. $P.E = w \times h = 2.5 \times 4 = 10$ joule

$K.E = M.E - P.E = 15 - 10 = 5$ joule

(C) 1. Boiling point 2. Water vapour

3. arachnids 4. battery

3 (A) 1. $N = 2n^2$

2. flat - worms and snails.

3. atom 4. weak

5. K 6. atom

(B) 1. The volume of the mixture will be less than 800 cm^3

Because some molecules of alcohol occupy the intermolecular spaces among water molecules.

2. The atom becomes excited atom.

3. The atomic number is equal to its mass number.

(C) 1. $^{35}_{17}Cl$ K L M: 2, 8, 7

2. Its name is chlorine.

3. The number of its neutrons

= Mass no. – atomic no.

= 35 – 17 = 18 neutrons.

4 (A)

Odd word	Scientific term
1. Copper	- Very active metals.
2. Height	- Factors affecting on kinetic energy.
3. Snail	- Animals with internal support.

(B) 1. - Salty solution : good conductor of electricity.

- Sugary solution : bad conductor of electricity.

2. - Oil : More free (intermediate).

- Oxygen : Completely free (unlimited).

3. - Neutrons : Neutral charge.

- Electrons : Negatively charged.

4. - Armadillo : Teeth less mammal.

- Hedgehog : Mammal has teeth.

(C) 1. c 2. c 3. d 4. b

5. a 6. d 7. c

12 El-Montazah Directorate

1 (A) 1. light – electric 2. three – six

3. radiation – conduction.

4. one – one 5. Mg – S.

(B) 1. Jellyfish 2. Hydrogen.

3. Gold. 4. Rabbit.

2 (A) 1. d 2. d 3. b

4. a 5. c 6. b

(B) 1. - A very active metal : reacts with oxygen as soon as being exposed to humid air.

- In active metal : find great difficulty in reacting with oxygen.

2. - Angiosperms :

Their seeds are formed inside fruit envelope.

- Gymnosperms :

Their seeds are formed inside cones.

(C) 1. K.E = Zero.

2. P.E = Weight × height

= 800 × 4 = 3200 joule.

3 (A) 1. more than 2. 32

3. radiation. 4. heron.

5. dioecea. 6. $2n^2$.

(B) 1. $^{24}_{12}Mg$ K L M: 2, 8, 2 active element.

2. $^{36}_{18}Ar$ K L M: 2, 8, 8 in active element.

(C) The mass of 1 cm^3 of water = 1 gm.

4 (A) 1. The density.

2. Boiling point.

3. Quantum

4. Copper - gold alloys.

5. Water compound.

6. Sun.

(B) 1. Duck. 2. Electric heater.

3. Alga 4. Salty solution.

(C) Density = $\frac{Mass}{Volume}$

M = D × V

= 7.8 × 3

= 23.4 gm.

13 El-Agamy Directorate

1 (A) 1. b 2. d 3. a 4. a 5. d 6. c

(B) 1. Because some molecules of alcohol occupy the intermolecular spaces among water molecules.

2. To enable the camel wandering through the hot desert sand.

3. Because when air around the heater is heated, its density decreases so it rises up to warm the room, while the cold air falls down to be heated again and so on.

4. Because the number of negative electrons which revolve around the nucleus is equal to the number of positive protons in the nucleus.

2 (A) 1. Boiling point. 2. Taxonomy.

3. Potential energy. 4. Quantum.

5. Camouflage.

(B) 1. Julius. 2. Sun.

3. Helium. 4. Vougheir.

5. Stainless steel.

(C) 1. It is the smallest part of matter which can exist freely and it has the properties of matter.

2. It is a group of more similar living organisms in shape that can reproduce to give birth of new fertile individuals which are able to reproduce and keeping the existence of the species.

3 (A) 1. mass – gm/cm^3.

2. increases – decreases.

3. arthropods – three 4. wings – fly.

5. conduction – radiation.

(B) 1. Na K L M: 2, 8, 1 2. K L: 2, 5

3. Ca K L M N: 2, 8, 8, 2 4. He K: 2

(C) 1. Weight = mass × acceleration due to gravity

= 5 × 10 = 50 N

P.E = Weight × height

= 50 × 2 = 100 joule

2. K.E = $\frac{1}{2}$ × mass × $(speed)^2$

= $\frac{1}{2}$ × 10 × $(2)^2$ = 20 joule.

4 (A) 1. (✗) 2. (✗) 3. (✗)

4. (✓) 5. (✗) 6. (✓)

(B) 1. It transfers to higher energy level and the atom becomes excited atom.

2. It will die.

3. The potential energy increases to double.

4. Its molecules gain thermal energy and their speed increases so intermolecular space increases and intermolecular force becomes weaken.

Al Qalyoubia Governorate

14 Science Inspectorate

1 (A) 1. Copper-gold – nickel-chrome

2. mercury – bromine.

3. light – chemical

4. external – internal

(B) 1. Potassium. 2. Amoeba.

3. Helium. 4. Wax.

(C) The volume of marble = volume of water and marble – volume of water

= 60 – 40 = 20 cm^3

D = $\frac{M}{V} = \frac{100}{20}$ = 5 gm/cm^3

2 (A) 1. Excited atom. 2. Species.

3. Law of conservation of energy.

4. Compound.

(B) 1. radiation 2. Vougheir.

3. Salty 4. Zinc

(C) Weight = Mass × acceleration due to gravity

Weight = 0.08 × 10 = 0.8 N

P.E = Weight × height

h = $\frac{PE}{W} = \frac{0.8}{0.8}$ = 1 m.

3 (A) 1. (✓) 2. (✗) —— increases ——

3. (✓) 4. (✓)

(B) 1. Ca K L M N: 2, 8, 8, 2 2. Cl K L M: 2, 8, 7

3. N K L: 2, 5 4. Na K L M: 2, 8, 1

(C) Iron : Because it has density more than that of water, while the others have densities less than that of water.

4 (A) 1. a 2. b 3. a 4. d

(B) 1.

P.O.C.	Solids	Gases
The attraction force:	Very strong.	Very weak.

2.

P.O.C.	Sodium	Copper
The chemical activity :	Very active metal.	Less active metal.

(C) 1. S 2. Fe
3. K 4. He

El Menofia Governorate

15 Menouf Directorate

1 (A) 1. gm/cm³ – volume
2. work – joule 3. Na – K
4. Sloth – armadillo

(B) 1. 7 2. $\frac{1}{2}$
3. 16 4. 11

(C) Because some molecules of table salt occupy the intermolecular spaces among water molecules.

2 (A) 1. b 2. b 3. c 4. b

(B) 1. (✓) 2. (✓)
3. (✗) 4. (✓)

(C)

P.O.C.	Heat transfers by conduction	Heat transfers by radiation
The medium transfers through	Some solid objects	No need for a material medium (Space)

3 (A) 1. Taxonomy
2. Law of conservation of energy
3. Boiling point 4. Atom

(B) 1. Meteor 2. Sun
3. Water vapour 4. ${}_{18}Ar$

(C) - Insects : have 3 pairs of jointed legs.
- Arachnids : have 4 pairs of jointed legs.

4 (A) (1) 1. 35 2. 3 levels
(2) 1. element 2. compound
(3) 1. 40 joule
2. $W = \frac{P.E}{h} = \frac{40}{4} = 10$ N
(4) 1. one pair in each jaw
2. one pair in lower jaw but two pairs in upper jaw

(B) 1. equals 2. Copper
3. functional
4. radiation and convection

(C) An electric current passes through the wire

Dakahlia Governorate

16 Science Inspectorate

1 (A) 1. elements – atoms
2. 6 – 5
3. light – electric
4. shape – way of movement

(B) 1. c 2. d 3. d 4. c

(C) Volume of iron = $V_2 - V_1 = 110 - 100 = 10$ cm³

$D = \frac{M}{V} = \frac{78}{10} = 7.8$ gm/cm³

2 (A) 1. Boiling point. 2. Element.
3. Simple electric cell.
4. Functional adaptation.

(B) 1. 20 2. less than
3. beaks and legs 4. proteins

(C) P.E = W × H
= 10 × 8 = 80 joule
K.E = $\frac{1}{2}$ × mass × (speed)²
= $\frac{1}{2}$ × 0.5 × (6)²
= 9 joule
M.E = P.E + K.E = 80 + 9 = 89 joule

3 (A)

Odd word	Scientific term
1. Quantum	- Particles in the atom.
2. Cain	- Substances float on water surface.
3. Electric energy	- Resources of energy.
4. Solar oven	- Non-renewable resources of energy.

(B) 1. (✓) 2. (✗)
3. (✗) 4. (✗)

(C) Some adaptations took place in mammals' limbs to suit the way of movement.

4 (A) 1. ${}_{2}He$ – ${}_{18}Ar$ – ${}_{20}Ca$
2. The forelimbs are modified into wings to perform the function of flying.
3. - Sugar solution and sulphur : bad conductors of electricity.
- Salt solution and alkaline solution : good conductors of electricity.

4. The scientific idea:
the chemical energy stored in the lemon is converted into electric energy.

(B) 1. Silver element has symbol (Ag)
2. If an atom loses quantum of energy the electron transfers from L to (K) level.
3. African, Asian and Egyptian human belong to (the same) species.
4. Scorpion has (four) pairs of jointed legs.

(C) To overcome the decrease in temperature.

Gharbia Governorate

17 East Tanta Directorate

1 (A) 1. mercury – bromine
2. 4 – 1
3. double
4. internal – external
5. conduction

(B)

Odd word	Scientific term
1. Solar battery	- Reservation of heat energy
2. Aluminium	- Molecules of compounds
3. Solar cells	- Technological applications have negative effects on environment
4. Nitrogen	- Inert gases

(C) 1. Water is not used to put out petrol fires.
2. Electric wires are made up of copper or aluminium and covered by a plastic layer.

2 (A) 1. Functional adaptation
2. Law of conservation of energy
3. The intermolecular space
4. The excited atom

(B) 1. Maghemi 2. Copper-gold alloy
3. Rabbits 4. Aestivation

(C) P.E = W × H = 32 × 4 = 128 joule

3 (A) 1. (✗) ...... grams
2. (✓)
3. (✗) ...... Second air
4. (✗) ...... autotrophs

(B) Model (A):
1. [illegible] 2. 2

Model (B):
1. [illegible] 2. [illegible]

(C) 1. They produce new similar individuals from the same species (humans).
2. It will change its colour from green to yellow as it makes camouflage.

4 (A) 1. positively 2. Species
3. unicellular 4. different

(B) 1. Atomic number = 7
Mass number = 7
2. Object (B) – Object (A)
3. four pairs of jointed legs

(C) Kangaroo will feed on grass, while lions will feed on zebras and [illegible].

Beheira Governorate

18 Science Inspectorate

1 (A) 1. [illegible]
2. Hydrogen – nitrogen
3. Energy – joule
4. bird migration – aestivation

(B) 1. Transfer of heat by electric heaters
2. Copper-gold alloy
3. Rubber
4. Electric lamp

(C) 1. (B). Because its density is more than that of water (1 gm/cm³)
2. $D = \frac{M}{V}$
$V = \frac{M}{D} = $ [illegible] $= 200$ cm³

2 (A) 1. c 2. a 3. b 4. c

(B) 1. 12 2. 7
3. 3 pairs of legs
4. one pair

(C) 1. At the highest point:
M.E = P.E + K.E = [illegible] = 170 joule
2. At the ground:
K.E = M.E = 170 joule

3 (A) 1. Species
2. Melting point

3. The atom.

4. Transfer of heat by conduction.

(B) 1. d   2. e   3. b   4. a

(C) Maize plant : from angiosperms.

Pine plant : from gymnosperms.

1 (A)

Odd word	Scientific term
1. Aluminium	Molecules of compounds.
2. Solar cell	Resources of heat energy.
3. Spider	Animals with soft bodies.
4. Sugary solution	Good conductors of electricity.

(B) 1. positive   2. solids

3. electromagnetic pollution.

4. strong solid hoof.

(C) To overcome the decrease in temperature.

Suez Governorate

19 Suez Directorate

1 (A) 1. mercury - bromine.

2. kinetic - electric.

3. insects - arachnids.

4. Ag - Na.

(B) 1. f   2. d   3. b   4. a

(C) Volume of iron $= V_2 - V_1$

$= 120 - 100 = 20\ cm^3$

$D = \frac{M}{V} = \frac{156}{20} = 7.8\ gm/cm^3$

2 (A) 1. b   2. b   3. c   4. a

(B) 1. The petrol floats on water surface, so the fires don't put out.

2. It transfers to a higher energy level and the atom becomes excited atom.

3. They become unable to fly.

4. It can't capture insects.

(C) 1. Simple electric cell.

2. (1) copper plate.   (2) zinc plate.

(3) Dilute sulphuric acid.

3. It converts the chemical energy into electric energy.

3 (A) 1. Atomic number.

2. Insectivorous plants.

3. Transfer of heat by conduction.

4. Nickel-chrome alloy.

(B) 1. electromagnetic.

2. displacement.

3. Potassium.

4. Melting.

(C) 1. structural adaptation.

2. Four bendable fingers.

3. It feeds on meat.

4 (A) 1. - Bean : dicotyledon.

- Wheat : monocotyledon.

2. - Neutron : neutrally charged.

- Proton : positively charged.

3. - Element : consists of similar atoms.

- Compound : consists of different atoms.

4. Mechanical energy :

can be produced by electric motor.

Heat energy :

can be produced by electric heater.

(B) 1. Amoeba.

2. Salty solution.

3. Copper-gold alloy.

4. Rubber.

(C) 1. To overcome the decrease in temperature.

2. To enable the camel wandering through the hot desert sand.

Minia Governorate

20 St.Mark Schools

1 (A) 1. c   2. b   3. c   4. b   5. c   6. [illegible]

(B) 1. S   2. Fe

3. Na   4. Al

(C) 1. Because the number of negative electrons which revolve around the nucleus is equal to the number of positive protons in the nucleus.

2. Because the density of wood is less than that of water.

3. To capture insects.

4. Because when air is cooled, its density increases, so it falls down to cool the food in the refrigerator and the hot air rises up to be cooled again and so on.

2 (A) 1. Compound.

2. Mass number.

3. Transfer of heat by conduction.

4. Aestivation.   5. Energy.

6. Taxonomy.

(B) 1. [illegible]   2. [illegible]

3. [illegible]   4. [illegible]

(C) 1. - Insects : Have 3 pairs of jointed legs.

- Arachnids : Have 4 pairs of jointed legs.

2. - Rodents : Have one pair of incisors in each jaw.

- Lagomorphs : They have two pairs of incisors in the upper jaw and one pair in the lower jaw.

3 (A) 1. Copper-gold alloy.

2. Potassium.

3. Mercury.

4. Jellyfish.

5. Frogs.

6. Amoeba.

(B)

Device	Change of energy	
	From	To
1. Solar cell	Light	Electric
2. Electric heater	Electric	Heat
3. Simple electric cell	Chemical	Electric
4. Radio cassette	Electric	Sound
5. Dynamo	Kinetic	Electric

4 (A) 1. molecules - atoms.

2. helium - 2.

3. convection - radiation.

4. Sloth - armadillo.

(B) Volume of copper $= V_2 - V_1$

$= 105 - 100 = 5\ cm^3$

$D = \frac{M}{V} = \frac{44}{5} = 8.8\ gm/cm^3$

(C)

Odd word	Scientific term
1. [illegible]	[illegible]
2. [illegible]	[illegible]
3. [illegible]	[illegible]
4. [illegible]	[illegible]

Sohag Governorate

21 [illegible] Private Language School

1 (A) 1. [illegible]

2. [illegible]

3. material - non-material.

4. [illegible]

5. [illegible]

(B) 1. [illegible]

2. To protect them from rust and corrosion.

(C) [illegible]

2 (A) 1. [illegible]   2. a   3. [illegible]

4. [illegible]   5. d   6. [illegible]

(B) 1. [illegible]

2. [illegible]

3. [illegible]

4. To produce electric energy.

(C) 1. - Oxygen molecule : consists of two atoms.

- [illegible] molecule : consists of one atom.

2. - [illegible] : has 3 pairs of jointed legs.

- [illegible] : has 4 pairs of jointed legs.

3 (A) 1. [illegible]   2. Water molecule.

3. [illegible]   4. [illegible]

5. [illegible]

(B) 1. [illegible]   2. [illegible]

3. [illegible]   4. [illegible]

(C) Weight = mass × acceleration due to gravity

[illegible]

[illegible]

[illegible]

[illegible]

4 (A) 1. (✗) 2. (✗) 3. (✗)
4. (✓) 5. (✓) 6. (✓)

(B) 1. It is the simplest pure form of matter which can't be analyzed chemically into simpler form by simple chemical methods.

2. Energy is neither created nor destroyed, but it is converted from one form to another.

(C) 1. $_{3}Li$ (K: 2, L: 1) 2. $_{7}N$ (K: 2, L: 5)

3. $_{18}Ar$ (K: 2, L: 8, M: 8) 4. $_{20}Ca$ (K: 2, L: 8, M: 8, N: 2)

Qena Governorate

22 Science Inspectorate

1 (A) 1. solid – liquid
2. two – one
3. weight – height
4. paddles – swimming.

(B) 1. 4 2. $^{7}_{3}Li$ (K: 2, L: 1)

3. 12 4. $^{24}_{12}Mg$ (K: 2, L: 8, M: 2)

(C) It is a form of energy which is transferred from a higher temperature object to a lower temperature object.

2 (A) 1. compound.
2. Atomic number.
3. transfer of heat by radiation.
4. Hibernation.

(B)

Odd word	Scientific term
1. Armadillo	Mammals have teeth.
2. Sugar solution	Good conductors of electricity.
3. Ammonia	Molecules of elements.
4. Amoeba	Insectivorous plants.

(C) P.E = weight × height
$= 5 \times 4 = 20$ joule.

$K.E = \frac{1}{2} \times \text{mass} \times (\text{speed})^2$
$= \frac{1}{2} \times 0.5 \times (4)^2 = 4$ joule.

3 (A) 1. a 2. b 3. b 4. a

(B) 1. Q 2. protein
3. monoatomic 4. convection.

(C) Because the density of wood is less than that of water, while the density of lead is more than that of water.

4 (A) 1. (✗) 2. (✓) 3. (✗) 4. (✓)

(B) 1. Na 2. Fe 3. S 4. Ag

(C) - Insects : Have 3 pairs of jointed legs.
- Arachnids : Have 4 pairs of jointed legs.

Aswan Governorate

23 Al-Mostaqbal Language School

1 (A) 1. Copper-gold – nickel-chrome
2. mercury – bromine.
3. banana – molukhiyah.
4. Dieonea – drosera

(B)

Change of energy	
From	To
Electric	Kinetic
Electric	Light
Electric	Sound
Light	Heat

(C) P.E = Weight × Height
$\therefore$ Weight $= \frac{P.E}{H} = \frac{88}{11} = 8$ N.

2 (A) 1. c 2. d 3. b 4. a

(B) 1. Na 2. N 3. Al 4. P

(C) Because the molecules of table salt spread in the intermolecular spaces among water molecules.

3 (A) 1. Compound. 2. Quantum.
3. Heat energy. 4. Boiling point.

(B) 1. $^{4}_{2}He$ (K: 2) 2. $^{24}_{12}Mg$ (K: 2, L: 8, M: 2)

3. $^{40}_{18}Ar$ (K: 2, L: 8, M: 8) 4. $^{32}_{16}S$ (K: 2, L: 8, M: 6)

(C) Hoopoe will feed on meat, while hawk will feed on worms and snails.

4 (A) 1. (✗) 2. (✓) 3. (✗) 4. (✗)

(B) 1. - Rabbit : is a lagomorph animal that has two pairs of incisors in the upper jaw and one pair in the lower jaw.
- Squirrel : is a rodent animal that has one pair of incisors in each jaw.

2. - Beans plant : is a dicotyledon plant.
- Wheat plant : is a monocotyledon plant.

South Sinai Governorate

24 El-Tur Directorate

1 (A) 1. Molecule 2. Algae.
3. Inactive metals.
4. Law of conservation of energy.

(B) 1. Hydrogen chloride molecule.
2. Hedgehog. 3. Sun.
4. Secreting of poison in snakes.

(C) 1. (K: 2, L: 8, M: 2)

2. Its atomic number = 2 + 8 + 2 = 12

2 (A) 1. Hg – gold.
2. positive copper – negative zinc.
3. two atoms – three atoms.
4. Leaf insect – stack insect.

(B) 1.

P. O. C.	Rodents	Lagomorphs
1. Number of teeth :	Have one pair of incisors in each jaw.	Have two pairs of incisors in the upper jaw and one pair in the lower jaw.
2. Examples :	Rat - Squirrel	Rabbit

2.

P. O. C.	Solid objects	Gaseous objects
1. The way of heat tranfer :	By conduction.	By convection and radiation.
2. The motion of molecules :	Limited motion (vibrational motion).	Completely free (unlimited).

(C) Weight = mass × acceleration due to gravity
$= 3 \times 10 = 30$ N.
P.E = Weight × height
$= 30 \times 7 = 210$ joule.

3 (A) 1. radiation 2. Energy
3. strong solid hoof 4. Sugary

(B) 1. It is used in making heating coils.
2. To help them in swimming.
3. It convert light energy into electric energy.
4. To overcome the decrease in temperature.

(C) 1. This means that the mass of 1 cm^3 of Iron = 7.8 gm.
2. The work done during the motion of the body = 90 joule.

4 (A) 1. The atom becomes an excited atom.
2. They will feed on worms and snails.
3. The air around the heater will be heated and its density decreases so, it rises up to warm the room, while the cold air falls down to be heated again and so on.
4. The petrol floats on water surface, so the fires don't put out.

(B) 1. b 2. a 3. c 4. c

(C) 1. work = force × displacement.
2. Number of neutrons = Mass number – Atomic number.

New Valley Governorate

25 El-Kharga Directorate

1 (A) 1. mercury – bromine.
2. zero – mechanical
3. electromagnetic – chemical
4. convection – radiation
5. Nougher – pole plant

(B) 1. It is used in making heating coils.

2. It enable them to tear the prey's flesh.

(C) P.E = Weight × height

$= 5 \times 4 = 20$ joule

$K.E = \frac{1}{2} \times \text{mass} \times (\text{speed})^2$

$= \frac{1}{2} \times 0.5 \times (3)^2 = 2.25$ joule

M.E = P.E + K.E

$= 20 + 2.25 = 22.25$ joule

2 (A) 1. c 2. b 3. c 4. b
5. b 6. b 7. b 8. c

(B) Because the density of petrol is less than that of water so, petrol floats on water surface and water doesn't put out the petrol fires.

(C) 1. Ag 2. Cl 3. Pb 4. Na

3 (A) 1. Taxonomy. 2. The atom.

3. Quantum.

4. Transfer of heat by conduction.

5. Insectivorous plants.

6. Kinetic energy. 7. Heat energy.

8. Inert gases.

(B) It rusts due to its reaction with atmospheric oxygen.

(C) 1. Sloth. 2. Sun.

4 (A) 1. Energy is neither created nor destroyed, but it is converted from one form to another.

2. It is the ability of some living organisms to be hidden from their enemies or to capture the preys in the predatory species.

(B) 1. - Water molecule : molecule of compound.

- Nitrogen molecule : molecule of element.

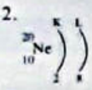
2. - Squirrel : It is arodent animal that has one pair of incisors in each jaw.

- Rabbit : It is a lagomorph animal that has two pairs of incisors in the upper jaw and one pair of incisors in the lower jaw.

3. Intermolecular force in solids : Very strong.

Intermolecular force in gases : very weak.

(C) 1. $^{24}_{12}Mg$ K L M — 2 8 2

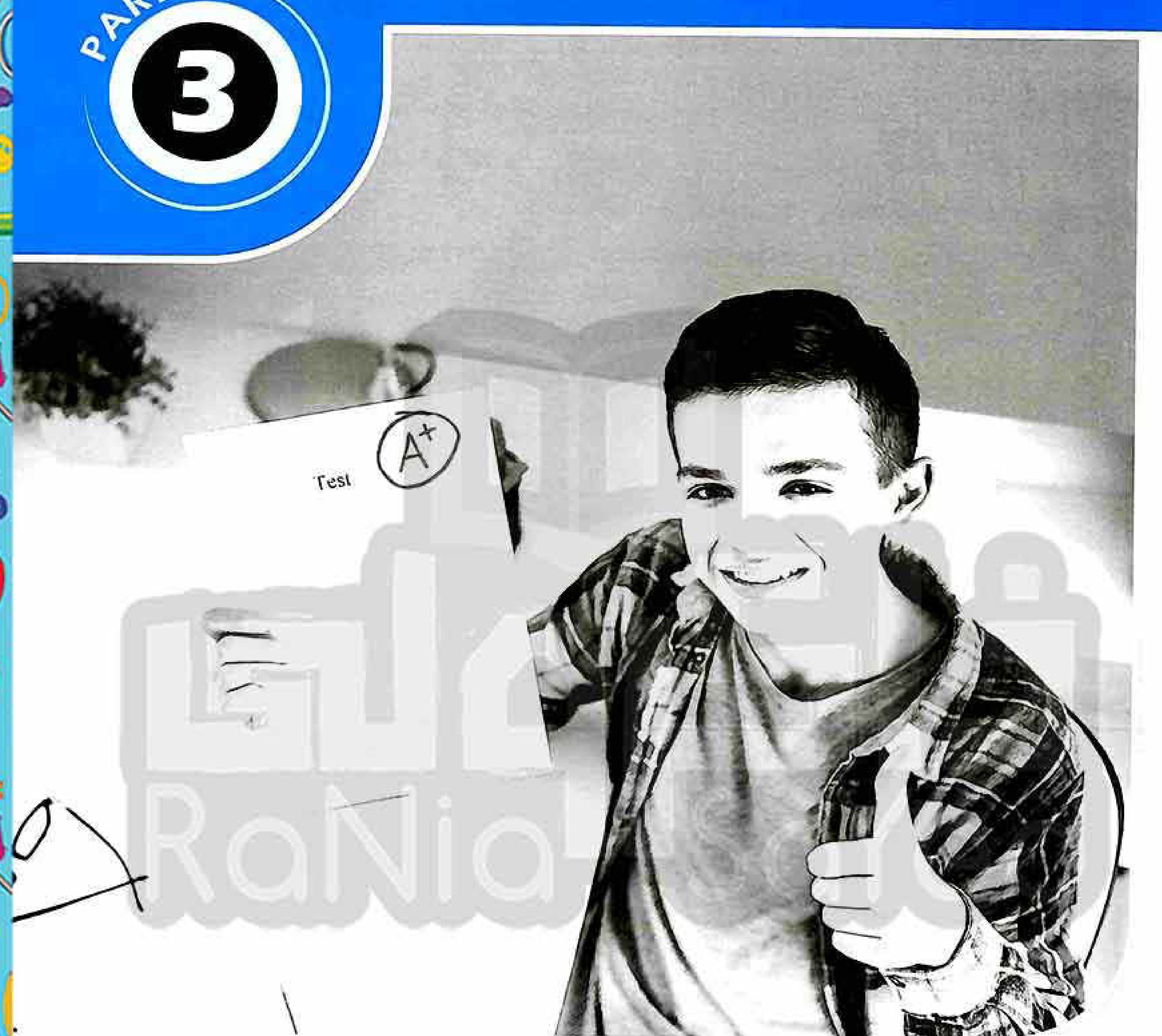
2. 

	1. $^{24}_{12}Mg$	2. $^{20}_{10}Ne$
1. Number of neutrons :	12	10
2. Chemical activity:	Less active metal.	Inert gas.

NOTES

Final Examinations 2021

PART 3



Final Examinations of some Governorates.



1 Cairo Governorate — St. Joseph's Language School

Answer the following questions :

Question 1

A Complete the following statements :

1. In solar cell .... energy changes into .... energy.
2. The monoatomic liquid is .... , while .... is diatomic liquid.
3. The symbol of sodium is .... , while that of gold is ....
4. Heat transfers through solids by .... , while through liquids by ....

B Mention one difference between :

1. The electron and the proton.
2. Insects and arachnids.

C Problem :

An object whose mass is 2 kg is moving at a speed of 5 m/sec. Calculate its kinetic energy.

Question 2

A Put (✓) or (✗) :

1. An alloy of nickel chrome is used in making heating coils. ( )
2. Birds migration is an example of structural adaptation. ( )
3. Pine plant is from an angiosperms plants. ( )
4. The energy level (N) is saturated by 32 electrons. ( )
5. The ammonia molecule consists of one nitrogen atom and three hydrogen atoms. ( )
6. Sugary solution is a good conductor of electricity. ( )

B Write the electronic configuration of :

1. $^{35}_{17}Cl$
2. $^{20}_{10}Ne$
3. $^{16}_{8}O$

C Problem :

A piece of iron, whose mass is 78 gm is placed in a measuring cylinder containing 40 cm^3 of water so water rises up to 50 cm^3. Calculate the density of iron.

Question 3

A Give reasons for :

1. The freezer is placed at the top of the fridge.
2. Inert gases are chemically inactive elements.
3. The atom is electrically neutral.
4. Some animals hibernate in winter.

B Choose the correct answer :

1. The attraction forces among solid molecules are ....
   a. strong. b. weak. c. almost not found.
2. The front limbs of whale are modified into ....
   a. legs. b. wings. c. paddles.
3. Kinetic energy is changed in electric energy in ....
   a. motor. b. dynamo. c. simple cell.
4. .... is from micro-organisms.
   a. Drosera b. Euglena c. Scolopendra

C Define :

1. Melting point. 2. Potential energy.

Question 4

A Write the scientific term :

1. The ability to do work or to make a change.
2. The smallest building unit of matter which can exist freely.
3. The number of protons inside the nucleus.
4. The ability of some animals to change their colour to stimulate the environment.

B Give an example for :

1. Very active metal. 2. Dicotyledon plant.
3. A rodent animal. 4. A solid substance which is soft at room temperature.

C What happens when ... ?

1. You add 50 cm^3 of ethyl alcohol to 100 cm^3 of water.
2. The electron gains a quantum of energy.

2 Cairo Governorate — Holy Family School

Answer the following questions :

Question 

A Give one example for :

1. A substance that has low melting point.
2. A plant isn't distinguished into roots, leaves or stems.
3. A bird feeds on fish.
4. A solution that is good conductor of electricity.

PART 3

B Complete the following sentences :

1. The nucleus of an atom contains positive .... and neutral ....
2. Copper-gold alloy is used in making ....
3. In the dry cell, ... energy changes into electric energy.
4. At highest point of the pendulum, the .... energy is maximum but .... energy is zero.

C Give reasons for :

1. Oil floats on water surface.
2. Argon ($_{18}Ar$) is inert gas that doesn't enter any chemical reaction.

Question 2

A Choose the correct answer :

1. .... converts electric energy into kinetic energy.
   a. Electric heater b. Electric fan c. Car engine d. Dynamo
2. The intermolecular spaces in iron is .... that in water.
   a. less than b. more than c. equal d. no correct answer
3. The symbol of .... element is (Ag).
   a. gold b. silver c. mercury d. copper
4. Birds migration is considered .... adaptation.
   a. structural b. behavioural c. functional d. (a) and (b)
5. .... is a micro-organism.
   a. Ant b. Amoeba c. Spider d. Snail
6. Heat transfers through liquids by ....
   a. conduction. b. convection. c. radiation. d. (b) and (c).
7. .... are animals with external support.
   a. Reptiles b. Snails c. Jellyfishes d. Fishes
8. .... is a permanent source of energy.
   a. Wind b. Coal c. The Sun d. Water

B What happens if ... ?

The object mass is doubled ? (related to its kinetic energy).

C Redraw the table then complete it :

P.O.C.	Insect	Arachnid
Example :	....	....
Number of jointed legs :	.... pairs	.... pairs

Question 3

A Write the scientific term :

1. The basic classification unit of the living organisms.
2. The sum of potential energy and kinetic energy.
3. The spaces among molecules.
4. Gases that their molecules are composed of one atom only.
5. Change of matter from solid state into liquid state.

B Correct the underlined words :

1. Ammonia molecule is composed of **three** atom(s).
2. Insectivorous plants absorb nitrogen to form **fats**.
3. Celebration balloons are filled with hydrogen or **oxygen** gases.
4. The rule ($2n^2$) is used to fill the energy levels with **protons**.
5. Friction generates (produces) **light** energy.

C Redraw the table then complete it :

P.O.C	Energy used	Energy produced
Photosynthesis :	....	....
Dry cell :	....	....

Question 4

A Cross out the odd word :

1. Vougheir – Bean – Pea – Wheat.
2. $_{11}Na$ – $_{19}K$ – $_{12}Mg$ – $_{3}Li$
3. Wood – Cork – Ice – Nail.
4. Evaporation – Hibernation – Aestivation – Birds migration.

B Answer the following :

In the following atom ($^{27}_{13}Al$).

1. Draw the electronic configuration.	....
2. The atomic number =	....
3. The mass number =	....
4. Number of neutrons =	....

C What happens when ... ? Hot object touches a cold object.

PART 3

3 Cairo Governorate — Al-Farouk Islamic Language School

Answer the following questions :

Question 

A Write the scientific term for each of the following :

1. Ability to do work or cause change.
2. The total number of protons and neutrons inside the nucleus.
3. Animal that is considered an example for structural, functional and behavioural adaptations.
4. The smallest unit of matter construction which reacts chemically.

B Choose the correct answer :

1. Heat transfers by radiation through ....
   a. liquids only. b. gases only.
   c. material media and non-material ones. d. metals only.
2. From animals with internal support ....
   a. octopus. b. fish. c. snail. d. jellyfish.
3. Silver is symbolized by ....
   a. Hg b. S c. Si d. Ag
4. Chemical energy can be stored in ....
   a. car battery. b. stretched spring.
   c. raising a load upwards. d. car lamps.
5. .... is an example for plants that reproduce by spores.
   a. Pine b. Bean c. Vougheir d. Wheat
6. An object of mass 2 kg is moving at a speed of 4 m/s, has kinetic energy ....
   a. 16 J. b. 64 J. c. 32 J. d. 128 J.

C Copy the following table at your answer sheet, then complete it :

Technological applications	Resource of energy Permanent/Non-renewable	Effect on environment Polluted/Non-polluted
1. Coal fire	....	....
2. Petroleum car engine	....	....
3. Gas stove	....	....
4. Solar heater	....	....

D **Cross out the unsuitable word, then write the relation between the other words :**

1. Bean – Pea – Maize – Pine – Wheat.
2. Petroleum – Wood – Cork – Iron.
3. Locust – Mosquito – Spider – Cockroach – Fly.

Question 2

A **Complete the following statements :**

1. The front limbs of whale are modified into .... to help it to ....
2. When a body is raised up, the potential energy ...., while the kinetic energy ....
3. .... and .... are examples for insectivorous plants.

B **Solve the following problem (Write all laws and measuring units used) :**

In an experiment to determine a liquid density, the following results are recorded :

– The mass of an empty cylinder = 65 gm.

– The mass of the cylinder containing liquid = 155 gm.

– The volume of the liquid measured by a graduated cylinder = 100 cm^3. **Calculate liquid density.**

C **"Each modification is for specific function" In a table, write the function of each of the following :**

1. Front teeth of hedgehog.
2. Wide indented beak of duck.
3. Pads of camel.
4. Beaks of hawks.

D **What happens in each of the following cases ... ?**

1. Leaving a piece of iron exposed to moist air for a period of time.
2. Friction of the bicycle wheels to a rough surface.
3. When energy of an electron becomes larger than the energy of the level in which it rotates by an amount of energy equals a quantum.
4. A ball is raised upwards, then it is left to fall downwards.

Question 3

A **Give reasons for each of the following :**

1. Atom is electrically neutral.
2. Individuals of the same species have different characters.
3. The heater is placed on the ground.
4. Some species of birds migrate from their original habitats in winter.



B Copy the following table at your answer sheet, then complete it :

Points of comparison	Ice	Water	Water vapour
1. Keeping shape and volume:	....	....	....
2. Intermolecular force:	....	....	....

C Rewrite the underlined words in following sentences after correcting :

1. **Neutrons** are positively charged.
2. **Fuel** energy is considered from the clean energy resources.
3. **Bean** plant is considered from monocotyledons.
4. **Oxygen** gas is an inert gas that couldn't share in chemical reactions at normal conditions.

D Choose from (B) what suits from (A) :

(A)	(B)
1. Density measuring unit	a. conduction.
2. Travelling of solar heat to the Earth	b. cm^3.
3. Substances conduct heat and electricity	c. radiation.
4. Factors affecting kinetic energy of an object	d. copper and iron.
5. Volume measuring unit	e. gm.
6. Simple cell is an example for energy transformation	f. gm/cm^3.
	g. wood and plastic.
	h. object's weight and its height.
	i. from chemical to electric.
	j. object's mass and its speed.
	k. from electric to chemical.
	l. cm^2.

Question 4

A Give an example showing each of the following :

1. Vertebrate animal.
2. Teethless mammals.
3. Animal makes hibernation.
4. Camouflage in insects.
5. Animal makes aestivation.

B Copy the following table at your answer sheet, then complete it :

Element	Electronic configuration			
	K	L	M	N
$^{23}_{11}Na$	....	....	....	....
$^{24}_{12}Mg$	....	....	....	....

C Solve the following problem :

Find the potential energy of an object its mass is 5 kg when found at height 10 m from ground, consider gravity acceleration = 10 m/s^2.

D The figures below represent the electronic configuration of atoms of some elements :

(A) +8 ±8 : 2, 6

(B) +12 ±12 : 2, 8, 2

(C) +17 ±18 : 2, 8, 7

Study these figures well, then determine each of the following :

Find	Atom (A)	Atom (B)	Atom (C)
Atomic number of each atom :	....	....	....
Mass number of each atom :	....	....	....

4 Cairo Governorate — Al-Waha Language School

Answer the following questions :

Question 1

A Write the scientific term :

1. Negatively charged particles of negligible mass revolve around the nucleus.
2. Organisms that can't be seen by the naked eye and they spread in air, water and soil.
3. The way by which the heat is transferred through gases and liquids.
4. The behaviour that frogs and toads do in the winter to avoid the low temperature.
5. The ability of some living organisms to be hidden from their enemies.
6. The mass of unit volume of the substance.
7. The gases which their molecules consist of one atom.
8. A group of animals that have one pair of incisors in each jaw.
9. Energy is neither created nor destroyed, but it is converted from one form to another.

PART 3

10. An alloy used in making jewels.
11. The monoatomic liquid molecule.
12. The temperature at which a substance changes from the liquid state to gaseous state.

B If a ball : Thrown upwards to reach 10 metres and its weight is 5 newton. Calculate the potential energy at :

1. The highest point.
2. The ground.

Question 2

A Complete the following sentences :

1. Energy is the ability to do .... and its measuring unit is ....
2. The molecule of water consists of .... and ....
3. Insects have .... pairs of jointed legs as ....
4. Plants may carry large-sized leaves such as .... and some has small-sized leaves such as ....
5. In the melting process, solid molecules .... energy and change into .... state.
6. Birds migration is .... adapation.
7. The matter is composed of small units called .... , while these units are consisted of smaller units called ....
8. For a truck and a small car moving at the same speed, kinetic energy of the truck is .... than the kinetic energey of the car.
9. Movement of particles and friction between them produce .... energy.
10. .... is the main source of energy on the Earth's surface and it is a permanent energy resource.
11. The beaks of birds that feed on aquatic snails and worms are .... and ....
12. The energy stored in the food is .... energy, while .... energy is produced from the dry cell.

B Give reasons for :

1. Cooking pans are made of aluminium, while their handles are made of plastic.
2. It is easy to divide an amount of water into smaller parts.
3. No changes happen in the potential energy when the objects move horizontally.
4. Some plants pounce (hunt) and digest insects.

Question 3

A Put (✓) or (✗) :

1. Copper is a good conductor of electricity. ( )
2. The colour is used to differentiate between sugar and salt. ( )
3. Bean is considered from monocotyledon plants. ( )

4. Scorpion and armadillo are insects. ( )
5. The temperature of particles decreases when their movement increases. ( )
6. Hot water is lighter than the cold water. ( )
7. Reptiles have an external support. ( )

B Write the symbols of the following elements :

1. Calcium. 2. Aluminium. 3. Nitrogen.
4. Phosphorus. 5. Silver. 6. Hydrogen.

C If the density of alcohol is 0.8 gm/cm^3, find the volume if its mass is 88 gram.

Question 4

A Correct the underlined words :

1. Oxygen molecule consists of **three atoms**.
2. The molecule of a compound consists of **similar** atoms.
3. Number of **protons** = Mass number – Atomic number.

B Mention the changes of energy in the following :

Examples	Energy used	Energy produced
1. Solar heater:	....	....
2. Photosynthesis:	....	....

C State a difference between each of the following :

1. A rabbit and a squirrel.
2. Pea plant and wheat plant.
3. The camel's pad and the horse's hoof.

D Write the electronic configuration of the following elements and mention the type of each one (active or inactive) :

a. $^{7}_{3}Li$ b. $^{24}_{12}Mg$ c. $^{39}_{19}K$ b. $^{20}_{10}Ne$

5 Cairo Governorate — Gaber El-Ansary Language School

Answer the following questions :

Question 1

A Complete the following :

1. Density is the .... of unit volume of the matter and its unit is ....
2. Hydrogen molecule consists of .... atoms, while argon molecule consists of .... atoms.







PART 3

3. .... is the ability to do work and its measuring unit is ....
4. In photosynthesis process .... energy changes into .... energy.
5. The cockroach belongs to .... , while the scorpion belongs to ....

B Write the chemical symbol for :

1. Sodium. 2. Aluminium. 3. Iron. 4. Chlorine.

Question 2

A Write the scientific term :

1. The ability of some body organs and tissues to do a certain function.
2. The way by which heat is transferred from the Sun to the Earth.
3. Energy is neither created nor destroyed but it is changed from one form to another.
4. Imaginary places around the nucleus in which the electrons move according to their energies.
5. The temperature at which liquid starts to change into gas.
6. The work done during the motion of an object.

B Problem :

Find the potential energy of an object its mass is 7 kg when it is found at a height of 10 m from the ground. [$g = 10\ m/s^2$]

Question 3

A Put (✓) or (✗) :

1. The cold air rises up, while hot air falls down. ( )
2. The motion of gaseous molecule is limited. ( )
3. Heat is transferred through different media by conduction and convection only. ( )
4. Mercury is from liquid metals. ( )

B Give reasons for :

1. The nucleus has a positive charge.
2. The kinetic energy will increase four times if the speed of the moving object is doubled.
3. Camel's limbs end in a thick flat pad.

Question 4

A What is meant by ... ?

1. Mass number. 2. Mechanical energy.

B Write the electronic configuration for :

1. $^{4}_{2}He$ 2. $^{16}_{8}O$ 3. $^{24}_{12}Mg$

C Give one example on :

1. Fern plant. 2. Monocotyledon plant. 3. A vertebrate animal.

6 Cairo Governorate

East Nasr City Educational Directorate
Science Inspection

Answer the following questions :

Question 

A Complete the following statements :

1. .... and .... belong to teethless mammals.
2. The measuring unit of mass is ...., while .... is the measuring unit of volume.
3. .... and .... are examples of insectivorous plants.
4. Matter consists of small building units called .... , which consist of smaller building units called ....
5. Potential energy = ... × ....

B Problem :

When a piece of iron of mass 78 gm is put in a graduated cylinder containing 100 cm^3 of water, the reading of the cylinder becomes 110 cm^3. Calculate the density of iron.

C Give an example for each of the following :

1. A device changes kinetic energy into electric energy.
2. Plants reproduce by spores.

Question 

A Write the scientific term for each of the following :

1. The simplest state of matter which can't be decomposed into a simpler one by chemical methods.
2. It is the amount of energy lost or gained by an electron when it transfers from one energy level to another.
3. The ability to do work or to make change.
4. The temperature at which matter changes from liquid state to gaseous state.
5. The ability of some living organisms to simulate the dominant environmental conditions to be hidden from their enemies or even to capture the preys.

B Compare between each of the following :

1. Insects and arachnids. According to the (number of legs)
2. Bean plant and maize plant.
3. Solid and gas. (Concerning attraction force among molecules)

C Write the electronic configuration of the following elements :

1. $_{16}S$ 2. $_{7}N$ 3. $_{20}Ca$

PART 3

Question 3

A Choose the correct answer :

1. The electric energy is converted into kinetic energy in ....
   a. electric lamp. b. cellular phone. c. electric fan.
2. .... is a permanent source of energy.
   a. Petrol b. The Sun c. Coal
3. Heat is transferred by radiation through ....
   a. liquids only. b. gases only.
   c. material media and non-material ones.
4. Scorpion belongs to ....
   a. insects. b. arachnids. c. mammals.
5. Energy is neither created nor destroyed but it can be transformed into another form, this law is known as law of ....
   a. conservation of energy. b. conservation of matter. c. kinetic energy.
6. From inert gases is ....
   a. nitrogen. b. helium. c. oxygen.

B Give reasons for each of the following :

1. The atom is electrically neutral in its ordinary state.
2. The freezer is put at the top of the fridge.
3. A camel's limb ends in a thick flat pad.
4. Water is not used to put out petrol fires.

C Write the chemical symbol of :

1. Silver. 2. Calcium. 3. Aluminium. 4. Sodium.

Question 4

A Put (✓) sign or (✗) sign in front of the following sentences :

1. Liquids have definite shapes and volumes. ( )
2. Iron rusts when exposed to dry air. ( )
3. Kinetic energy changes into heat energy by friction. ( )
4. Fishes are from animals that have an internal support. ( )
5. Chemical energy is stored in the car battery. ( )
6. The motion of the molecules of gas is limited. ( )
7. Hawks have strong and sharp crooked beaks to tear the prey's flesh. ( )

B **Mention the energy transformations in the following :**

1. Electric bell. 2. Simple cell. 3. Electric heater.

C **Cross out the unsuitable word for each in the following :**

1. Petroleum – Wood – Cork – Iron.
2. Reptiles – Fishes – Birds – Worms.
3. Sodium – Copper – Aluminium – Iron.
4. Bee – Spider – Fly – Ant.

7 Giza Governorate — Lycée El-Haram Language Schools

Answer the following questions :

Question 1

A **Put (✓) or (✗) and correct the wrong ones :**

1. The distance between the molecules in solids is very tiny. ( )
2. The mass number is the amount of energy gained or lost to transfer an electron from an energy level to another. ( )
3. The chemical symbol of the sodium element is (Sa). ( )
4. Kinetic energy is a work done during a motion of an object. ( )
5. Heat transfers by convection in liquids only. ( )
6. Arachnids have 4 pairs of jointed legs such as a spider. ( )
7. The bean plant is an example of dicotyledon plants. ( )

B **What is meant by the following ... ?**

1. The temperature.
2. The mass number.
3. Structural adaptation.
4. Heat transfers by radiation.

C **Write the symbols of the following elements :**

1. Sodium. 2. Gold. 3. Iron.

Question 2

A **Choose the correct answer :**

1. As an object is launched upwards ....
   a. its speed decreases. b. its speed increases.
   c. its kinetic energy increases. d. its potential energy decreases.
2. The 3^{rd} energy level in the atom contains .... electrons.
   a. 2 b. 18 c. 8 d. 32
3. All the element are active but .... is not active.
   a. $_{1}H$ b. $_{6}C$ c. $_{7}N$ d. $_{18}Ar$

PART 3

4. The colour property is a distinguishing factor between ....

a. flour and table salt.
b. iron and gold.
c. oxygen and carbon dioxide.
d. no correct answer.

5. Particles which are negatively charged and negligible mass are ....

a. protons.
b. neutrons.
c. electrons.
d. photons.

6. Electric energy is converted into kinetic energy in ....

a. electric lamp.
b. cellular phone.
c. electric fan.
d. battery.

7. Insects have .... of jointed legs.

a. 3 pairs
b. 4 pairs
c. 2 pairs
d. 44 pairs

B Choose a phrase from column (A), what suits it in column (B) :

(A)	(B)
1. Total number of protons and neutrons is	a. are examples of small terrestrial plants.
2. Substances are good electric and heat conductors such as	b. example of animal that undergo aestivation.
3. Vougheir and adiantum	c. iron and aluminium.
4. Jerboa is	d. mass number.

C Compare between solid, liquid and gas regarding to :

Attraction forces.

Question 3

A Complete each of the following :

1. Alloy of .... used in making jewels.
2. The density is the .... of unit volume of a substance, its unit is ....
3. The liquid element its molecule composed of one atom is ...., while that composed of two atoms is ....
4. The electrons revolve around the nucleus in orbits known as ....
5. Electric cables are made up of .... or ....
6. Animals with external support such as .... and ....
7. Paddles of whales and dolphins are for ....

B Give reasons for :

1. The atom is electrically neutral.
2. The camel pad ends in a thick flat.
3. The inert gases do not react chemically with other element.

C Write the electronic configuration of the following atoms and indicate the number of electron in the outermost level and the number of neutrons.

1. $^{27}_{13}Al$
2. $^{35}_{17}Cl$

Question 4

A Write the scientific term :

1. Is a group of similar living organisms in shape that can reproduce to give birth of new fertile individuals.
2. Is the smallest individual unit of matter which can share in chemical reactions.
3. The ability of some living organisms to be hidden from their enemies or to capture the preys in the predatory species.
4. Energy stored in an object due to work done on it.
5. Molecule is composed of three atoms : 2 hydrogen and 1 oxygen.
6. It is the temperature at which a substance changes from a liquid state into geseous state.
7. Energy is neither created nor destroyed, but it can be transformed into another form.

B Calculated :

1. The density of an object if : mass = 500 gm and volume = 200 cm^3.
2. A ball was launched upwards at a speed 5 m/s up to height 6 m.
   Calculate the mechanical energy of the ball if its weight is 40 N and has a mass 5 kg.

C The migration is a type of adaptation for the some birds :

1. Why some species of birds are adapted to the migration?
2. What is the type of this adaptation?

8 Giza Governorate — Talaee Islamic Language School

Answer the following questions :

Question 1

A Choose the correct answer :

1. .... is from rodents that undergo aestivation.
   a. Rat b. Squirrle c. Jerboa d. Desert snail
2. The colour property is a distinguishing factor between ....
   a. table salt and flour. b. iron and gold.
   c. oxygen and nitrogen. d. oxygen and carbon dioxide.
3. An object potential energy is zero, when the object is at the ....
   a. maximum height. b. Earth's surface.
   c. when mass object increases. d. when the object speed increases.
4. .... insect exactly looks like the plant branches.
   a. Stick b. Beetle c. Leaf d. Locust



B Give reason for the following :

1. It is favorable to produce electricity from solar energy than fuel burning.
2. Water is not used to extinguish petrol fires.
3. The atom is electrically neutral.
4. The front limbs in the dolphin are different from the bat's ones although they are structured with similar bones.

C Compare between bean plant and corn plant.

Question 2

A Complete the following statements :

1. Equal masses of different substances have different .... and ....
2. .... is the basic unit of classification in living organisms.
3. .... energy is changed into electric energy in the battery.
4. .... take the shape of the container but .... have definite shape.
5. The liquid element which is composed of one atom is .... , while that composed of two atoms is ....

B Write the electronic configuration for the following elements :

$\left({}^{27}_{13}Al - {}^{16}_{8}O\right)$ then calculate the number of neutrons.

C What is meant by quantum ?

Question 3

A Write the scientific term :

1. The transfer of heat through solid objects from part to another.
2. The work done during motion of the body.
3. The spaces found among the molecules of a substance.
4. The ability of some living organisms to stimulate the dominant environmental conditions to be hidden from their enemies or even to capture the preys.
5. The smallest particle of the matter can exist freely and has the properties of its substances.

B What is meant by melting point ?

C Find the weight of an object of potential energy 88 joules, when found at height 11 metre.

Question 4

A Correct the underlined words :

1. Distance among **solids** molecules is very large.
2. The substances that can conduct heat and electricity are **wood and plastic**.
3. **The coal** is a permanent source of energy.
4. **Camphor tree** is an example of insectivorous plant.

B Choose the odd words out then mention the relation between the rest :

1. Mosquito – Spider – Cockroach – Ant.
2. Snake – Jellyfish – Shark – Frog.
3. ${}_{6}C - {}_{10}Ne - {}_{9}F - {}_{7}N$

C What is meant by the density of aluminium is 2.7 gm/cm^3 ?

9 Giza Governorate — Pyramids Language School

Answer the following questions :

Question 

A Write the scientific term :

1. The mass of unit volume of matter.
2. The sum of the protons and neutrons in the nucleus of an atom.
3. The sum of the potential and kinetic energies of the body.
4. Energy is neither created nor destroyed, but it is converted from one form to another.

B Mention one use for :

1. Copper-gold alloy.
2. Simple cell.

C Problem :

The mass of an empty beaker = 75 gm where the mass of the beaker filled with liquid = 153 gm while the volume of the liquid = 100 cm^3. Find the density of the liquid.

Question 2

A Complete the following :

1. The molecule of water consists of two .... atoms and one .... atom.
2. From very active metals .... and ....
3. Kinetic energy = $\frac{1}{2}$ × .... × ....
4. From the animals that have soft body .... and ....

PART 3

B Give reasons for :

1. Water birds such as ducks and geese have wide indented beaks.
2. Neon atom ($_{10}Ne$) does not enter a chemical reaction.

C Write the electronic configuration of the following :

1. $_{12}Mg$
2. $_{19}K$

Question 3

A Correct the underlined words :

1. **Compound** is the smallest part of matter which can exist freely and it has the properties of matter.
2. In the solar cell the solar energy is changed into **heat** energy.
3. **Kinetic** energy stored in the object due to a work done on it.
4. The ability of some living organisms to be hidden from their enemies is **hibernation**.

B Problem :

Calculate the potential energy of an object of 20 N weight is placed at 5 m height.

C What will happen if ... ?

1. Hawks and vultures have not sharp and strong crooked beaks.
2. You add 200 cm^3 of ethyl alcohol to 300 cm^3 of water in a measuring cylinder.

Question 4

A Choose the correct answer :

1. It is possible to distinguish between sugar and salt by their ....
   a. taste. b. colour. c. smell.
2. The measuring unit of energy is ....
   a. newton. b. kilogram. c. joule.
3. Vougheir and adiantum reproduce by ....
   a. seeds. b. roots. c. spores.
4. From the teethless mammals ....
   a. lion. b. sloth. c. rabbit.
5. The heat of the Sun doesn't reach to the Earth by ....
   a. radiation. b. conduction. c. no correct answer.

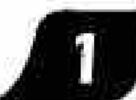
B Compare between : Insects and arachnids according to the number of jointed legs.

C Mention an example of :

1. Unicellular micro-organisms.
2. Insectivorous plants.

10 Giza Governorate — Science Inspectorate

Answer the following questions :

Question 1


A Write the scientific term :

1. Energy stored in the object due to work done on it.
2. It is the temperature at which matter begins to change from solid state to liquid state.
3. The ability of some living organisms to hidden from their enemies.
4. A way of heat transfer through solids.

B Write the symbols of the following elements :

1. Calcium. 2. Silver. 3. Zinc. 4. Potassium.

C What's the density of copper if the mass of a piece of it is 44 gm and it occupies a space of 4 cm^3?

Question 2


A Give reasons for :

1. The atom is electrically neutral.
2. Cooking pots have handles made up of wood.
3. Spider is not from insects.
4. The bike tire gets hot once you press the brakes.

B Mention the energy transformation in each of the following :

1. Electric heater.
2. Simple pendulum.

C Write the electric configuration of the following :

1. $^{24}_{12}Mg$ 2. $^{40}_{20}Ca$ 3. $^{16}_{8}O$

Question 3

A Calculate the kinetic energy of an object it's mass (12 kg) when it moves at a speed 20 m/s.

B Complete the following :

1. Measuring unit of volume is .... and that of mass is ....
2. The charge of protons is .... , while that of electrons is ....
3. Weight = ... × ....
4. .... is an example for plants that reproduce by spores.

C What happens when ... ?

1. Metallic spare parts of cars are not covered with grease.
2. Open a bottle of perfume for a period of time.

PART 3

Question 4

A Choose the correct answer :

1. Heat transfer by radiation through ....
   a. liquids only. b. gases only. c. metals only.
   d. material media and non-material ones.
2. The third energy level is saturated by .... electrons.
   a. 2 b. 10 c. 18 d. 8
3. Electric energy is converted into kinetic energy in ....
   a. electric lamp. b. cellular phone. c. electric fan. d. electric bell.
4. .... are from the animals which do not have body support.
   a. Reptiles b. Snails c. Jellyfishes d. Birds
5. The number of the anterior fingers in the hawk is ....
   a. 3 b. 4 c. 2 d. 5

B What is the function of ... ?

1. Long arm of monkey.
2. Wide indented beak of a duck.

C Find the weight of an object of potential energy 88 joule when found a height of 11 m.

11 Alexandria Governorate

East Educational Zone
Science Inspectorate

Answer the following questions :

Question 1

A Complete the following statements :

1. Equal masses of different substances have different ....
2. During vaporization process, liquid molecules .... energy and converted into .... state.
3. Kinetic energy increases by increasing .... and .... of the object.
4. Heat is transferred through gases by .... , while transferred through solids by ....
5. Plants that reproduce by formation of seeds are divided into .... and ....

B What is meant by ... ?

1. Quantum.
2. Potential energy.

C Write the symbols of the following elements :

1. Copper. 2. Silver. 3. Lead.

Question 2

A Write the scientific term :

1. A group of living organisms mostly similar to each other in their shape and produce new fertile members.
2. Imaginary places in which electrons can move according to their energies.
3. The simplest form of matter which can not be decomposed into simpler one.
4. It is the main source for the most energy resources on the Earth.
5. The pollution produced from the webs of wireless transmitters of cellular phones.
6. Plants that can't be distinguished into roots, stems and leaves.

B Give reasons for each of the following :

1. The freezer is found at the top of the fridge.
2. The fuel inside the car is similar to the food inside the body of the living organism.
3. The atom is electrically neutral.

C When a piece of iron mass 78 gm is put in a graduated cylinder containing 100 cm^3 of water, the water increases up to 110 cm^3. Calculate the iron density.

Question 3

A Put (✓) or (✗) in the front of each sentences and correct the wrong ones :

1. The attraction forces among molecules of solids are very weak. ( )
2. Sloth and armadillo are edentates mammals. ( )
3. In solar cells the solar energy is converted into heat energy. ( )
4. Spiders are arthropods that have three pairs of jointed legs. ( )

B Complete the following table by suitable completion :

Device	Type of energy resource
1. Solar heater :	....
2. Electric water heater :	....
3. Gas stove :	....

C Write down the electric configuration of the following atoms :

1. $^{32}_{16}S$ 2. $^{20}_{10}N$

PART 3

Question 4

A Choose the correct answer :

1. Some elements which has a great difficulty to react with oxygen is ....
   a. potassium. b. sodium. c. aluminium. d. platinum.
2. Electric energy is converted into kinetic energy in ....
   a. electric lamp. b. cellular phone. c. electric fan. d. electric bell.
3. In doubling the height of an object from the ground, its ....
   a. kinetic energy is increased to its double value.
   b. potential energy is increased to 3 times.
   c. mechanical energy is increased 4 times.
   d. potential energy is increased to its double value.
4. The scorpion belongs to ....
   a. arachnids. b. myriapods. c. mammals. d. insects.
5. In the filament of electric lamp the ....
   a. light energy is converted into mechanical energy.
   b. chemical energy is converted into light energy.
   c. electric energy is converted into heat energy.
   d. electric energy is converted into mechanical energy.
6. Heating coils are made up of .... alloy.
   a. iron-copper b. nickel-iron c. nickel-chrome d. chrome-copper
7. An object of 20 newton weight and it is placed at a height of 5 m, so its potential energy is .... joules.
   a. 50 b. 150 c. 100 d. 200
8. All of the following elements are inactive elements except ....
   a. $_{2}He$ b. $_{15}P$ c. $_{18}Ar$ d. $_{10}Ne$

B Give example showing each of the following :

1. An animal with a soft body.
2. A monocotyledon plant.
3. A myriapod animal.

C What is the mathematical relationship that binds between each of the following :

1. Weight of an object and its mass.
2. Mechanical energy of an object and its potential energy.
3. Potential energy, weight and height.

12 Alexandria Governorate — Middle Educational Zone

Answer the following questions :

Question 1

A Complete the following statements :

1. The mass of the atom is concentrated in the ....
2. The protons have .... charges.
3. Heat transfers from the Sun to the Earth by ....
4. From the examples of huge trees is ....
5. The gymnosperms plants as pine produces seeds inside ....
6. Arachnids have .... pairs of jointed legs.

B Mention one example for :

1. A permanent source of energy.
2. An amphibian undergoes hibernation.
3. Lagomorphs.
4. Camouflage in insects.

C Compare between the following :

1. Mercury and bromine concerning the molecule structure.
2. The car engine and the car cassette concerning the energy produced.

Question 2

A Correct the underlined words :

1. Liquids have **a fixed** shape.
2. The relation ($2n^2$) is not applied to energy level higher than **5^{th}** level.
3. In solar cell the solar energy is changed into **magnetic** one.
4. In simple cell the positive pole is a rode of **zinc**.
5. Secreting poison in snakes is considered as a **behavioural** adaptation.
6. Insectivorous plants catch and pounce insects to get **starch**.

B Cross out the odd word, then mention the common property between the rest :

1. Butter – Ice – Iron – Wax.
2. Armadillo – Lion – Tiger – Wolf.

C Give reasons for the following :

1. Electrician use a screwdriver made up of steel iron with woody handle.
2. Heater is placed on the ground, while the air conditioner is put at high position in the room.
3. The shallow water birds have long and thin beaks.

PART 3

Question 3

A Choose the correct answer :

1. The symbol of copper is ....
   a. C b. Co c. Cu
2. The attraction force among molecules of .... is very weak.
   a. oxygen b. oil c. aluminium
3. On doubling the height the potential energy is ....
   a. constant. b. doubled. c. increased four times.
4. An example of animals with internal support is ....
   a. octopus. b. snail. c. shark.
5. .... bird migrates in winter.
   a. Hawk b. Quail c. Ostrich
6. An example of plants that reproduce by forming spores is ....
   a. vougheir. b. wheat. c. cycas.

B Mention one use or function for the following :

1. Nickel-chrome alloy.
2. Simple electric cell.
3. Microscope.
4. Long arms and fingers in monkey.

C Write down the electronic configuration for $^{4}_{2}He$, then answer the following :

1. Calculate the number of neutrons.
2. Does this element share in chemical reaction ? And why ?
3. What is the use of this element ?

Question 4

A Write scientific term for the following :

1. The temperature at which, a substance changes from the liquid state to the gaseous one.
2. The product results from a combination between two or more atoms of different elements with constant weight ratios.
3. The sum of potential energy and kinetic energy.
4. A form of energy transfers from higher temperature to lower temperature.
5. Plants can't be distinguished into roots, stems and leaves.
6. The basic classification unit for living organisms.

B **What happens in the following cases and why ... ?**

1. If water is used to put out the petrol fires.
2. If you put a drop of potassium permanganate in a jar containing water.
3. Rubbing your hands together.

C **A racing bike moves with a speed of 20 m/s. Calculate its kinetic energy knowing that the mass of the bike is 8 kg.**

13 Alexandria Governorate — El-Agamy Educational Zone

Answer the following questions :

Question 

A **Choose the correct answer :**

1. The amount of energy gained or lost by the electron is called ....
   a. joule. b. quantum. c. neutron. d. proton.
2. .... reproduces by spores.
   a. Vougheir b. Pine c. Bean d. Wheat
3. The fourth energy level is saturated by .... electrons.
   a. 32 b. 18 c. 8 d. 2
4. When air heats up its density ....
   a. still constant. b. increases. c. decreases. d. (b) and (c).

B **Write the electronic configuration for :**

1. ${}^{24}_{12}Mg$ 2. ${}^{16}_{8}O$ 3. ${}^{40}_{18}Ar$

Question 

A **Put (✓) or (✗) in the following statements :**

1. The positive pole in a simple cell is lead. ( )
2. Heat transferred through solids by conduction. ( )
3. Jewels are made up of copper-gold alloy. ( )
4. All inert gases are monoatomic. ( )
5. Mass number is the sum of protons and electrons numbers. ( )

B **What happens when ... ?**

1. Coil the wire of a simple cell around a compass.
2. Putting of a drop of ink in water.

PART 3

Question 3

A Complete the following statements :

1. The potential energy of an object depends on .... and ....
2. .... and .... are very active metals.
3. An animal which has no body support such as ....
4. The atom nucleus contains .... and ....
5. Scolopendra belongs to ....
6. Plants reproduce by formation of seeds divided into .... and ....

B Give reasons for each of the following :

1. Wood floats on water surface, while a piece of lead sinks in it.
2. Camel's limbs end in a thick flat pad.

Question 4

A Write the scientific term for each of the following :

1. The sum of potential and kinetic energies of a body.
2. The temperature at which a solid substance starts to change into liquid.
3. The basic classification unit of living organisms.
4. Volume measuring unit.

B Problem :

Find the kinetic energy if the mass of the body is 5 kg and moves with a speed 10 m/sec.

C What's meant by ... ?

The conservation law of energy.

14 El-Qalyuobia Governorate — Memphis Language School

Answer the following questions :

Question 1

A Complete :

1. The liquid element which is composed of one atom is .... , while that is composed of two atoms is ....
2. The intermolecular forces among molecules of solids are .... and in gases are ....
3. .... is an example for micro-organisms that live in water.

4. Metallic bridges are painted from time to time to protect them from ....
5. When an electron transfers from an energy level near the nucleus to a higher one, it .... a quantum of energy and the atom becomes .... atom.
6. The molecule of hydrogen chloride consists of one atom of ...., and one atom of ....

B **On determining iron density using a piece of iron of mass 78 gm, the piece is immersed in 100 cm^3 of water, then water rises up to 110 cm^3. Calculate the density of iron.**

Question 2

A **Write the scientific term :**

1. Plants that can't be distinguished into roots, stems and leaves.
2. Energy neither be created nor destroyed.
3. The type of adaptation when birds migrate from one place to another.
4. The sum of the numbers of protons and neutrons inside the nucleus of the atom.

B **What are the differences between ... ?**

1. Hydrogen and helium.
2. Bat and whale (According to the adaptation of the front limbs).

C **Write down the electronic configuration and the type of the following elements :**

1. $^{7}_{3}Li$ 2. $^{20}_{10}Ne$

Question 3

A **Choose the correct answer :**

1. In car engine the chemical energy is changed into .... energy.
   a. magnetic b. electric c. mechanical
2. The electron is .... charged particle.
   a. positively b. negatively c. neutrally
3. The number of pairs of scorpion legs is ....
   a. 4 b. 3 c. 44
4. An object of weight 6 newtons, moved to a height 5 m, its potential energy is .... joules.
   a. 30 b. 75 c. 11

B **Give reasons for :**

1. Some birds have long thin beaks and long thin legs.
2. Wood floats on the surface of water.
3. Cooking pots are made of aluminium, while their handles are made of wood.

PART 3

C Put (✓) or (✗) and correct the wrong statement :

1. Energy is stored in the form of kinetic energy when the pendulum is displaced up. ( )
2. Insectivorous plants get the nitrogenous substances through photosynthesis. ( )
3. Angiosperms are flowering plants. ( )

Question 4

A Correct the underlined words :

1. **Ammonia** molecule consists of two atoms of hydrogen and one atom of oxygen.
2. The electron can transfer to a higher energy level if it **loses** energy.
3. **Rat** is considered from teethless mammals.
4. The **camel's** limbs end with strong hoofs.

B What happens when ... ?

1. The bones of the front limbs and fingers of monkey are not elongated.
2. You inserted two different metallic rods in a lemon connected by a wire.
3. You added 20 cm^3 of alcohol to 30 cm^3 of water in a measuring cylinder. And why?

C Give one example for each of the following :

1. A substance doesn't become soft on heating.
2. A gas which doesn't take a part in the chemical reaction.
3. A plant that reproduces by spores.

15 El-Sharkia Governorate — Franciscan Sisters School

Answer the following questions :

Question 1

A Give the scientific reasons :

1. The legs of water birds are palm.
2. The electrons are distributed to fill the (K) level before filling the (L) level.
3. The nucleus of the atom is positively charged.
4. The freezer is found at the top of the fridge.
5. Some animals undergo hibernation.

B Write the electronic configuration for the following element :

– ${}^{35}_{17}Cl$: Then calculate the atomic number – the mass number – the number of protons – the number of neutrons – the number of electrons – the number of energy levels having electrons – the number of electrons in the outermost energy level. Determine if the atom is active or inactive and mention the reason.

C Choose the correct answer :

1. An object potential energy is zero when the object ....
   a. is at the maximum height. b. is at the Earth's surface. c. mass increases.
2. Heat transfers by convection occurs through ....
   a. liquids only. b. gases only. c. liquids and gases.
3. .... is an example for micro-organisms.
   a. Amoeba b. Sloth c. Snail
4. Spider has .... pairs of jointed legs.
   a. two b. three c. four

Question 

A Write the scientific term for the following :

1. The smallest part of matter that can exist freely having the properties of matter.
2. The transfer of heat from hot object to another without any need for a material medium through which heat transfers.
3. The ability of some living organisms to simulate the dominant environmental conditions to be hidden from their enemies.
4. The sum of potential and kinetic energies.
5. A group of similar living organisms in shape that can reproduce to give birth of new fertile individuals.
6. Energy is neither created nor destroyed but it can be transformed into another form.

B Write the symbols for the following elements :

1. Aluminium. 2. Bromine. 3. Calcium. 4. Flourine. 5. Oxygen.

C Calculate the density of a piece of copper, if you know that its mass equals 60 gm, and its volume equals 10 cm^3.

Question 

A What happens when ... ?

1. Leaving a piece of iron exposed to moist air for a period of time. And why?
2. Dipping a copper rod and a zinc rod connected by a wire in diluted sulphuric acid.
3. Increasing the speed of a moving object to double. And why?

B Complete the following sentences :

1. If the height of an object increases to double, its potential energy increases to ....
2. Jerboa undergoes .... to overcome the .... in temperature.
3. In the car dynamo .... energy is changed into .... energy.

4. .... has an internal support, while .... has an external support.
5. When an object is launched upwards, its speed ....
6. .... is soft at room temperature, while .... can't be soften.

C Find the mechanical energy of a ball falls from 8 m height if its mass equals 4 kg and it falls with a speed 3 m/sec. (given that the gravity acceleration equals 10 m/sec^2).

Question 4

A Mention the difference between each of the following :

1. Wheat and pea.
2. Kinetic energy of an object at maximum height and on reaching the ground.
3. Intermolecular forces in solids and in gases.
4. Cockroach and scorpion.

B What is meant by each of the following ... ?

1. The density of iron equals 7.8 gm/cm^3.
2. Potential energy of an object equals 10 joules.

C Put (✓) or (✗) and correct the mistakes :

1. Taxonomy is a branch of biology that searches for the similarities and differences among living organisms. ( )
2. Motion of molecules is limited in liquids. ( )
3. The birds activity during the daylight is considered a functional adaptation. ( )
4. Friction turns mechanical energy to electric energy. ( )

16 El-Menofia Governorate — Shebin Elkom Educational Administration

Answer the following questions :

Question 1

A Write the scientific term for each of the following :

1. A liquid used to keep sodium and potassium metals from air.
2. It is the ability to do work or to make a change.
3. It is a basic classification unit for living organism.
4. Pollution produced from the web of cellular phone.
5. A modification in behaviour, structure of function of a living organism to become more adapted with environment.

B What is meant by ... ?

1. The kinetic energy of an object = 20 joules.
2. Camouflage.
3. Melting point of ice = 0°C
4. Density of metal = 7.8 gm/cm^3.

C Write the electronic configuration of :

1. $^{16}_{8}O$
2. $^{23}_{11}Na$

Then find :

a. Number of neutrons.
b. number of energy levels.

Question 2

A Complete the following :

1. The liquid element whose molecule composed of one atom is ...., while the liquid element which its molecule composed of two atoms is ....
2. An alloy of .... is used in making jewels, but .... alloy is used in making heating coils.
3. In the simple cell, ... energy changes into .... energy.
4. The number of jerboa's upper jaw incisors equals .... and the number of the rabbit's upper jaw incisors equals ....
5. The symbol of potassium atom is ...., while the symbol of silver atom is ....
6. .... is from very active metals but .... is from inactive metals.

B Give reasons for :

1. Freezer is found at the top of the fridge.
2. Some plants pounce insects.
3. The electrons are distributed to fill the (K) level before filling the (L) level.
4. Frog hibernates in winter.

C Find the potential energy of an object, whose mass = 200 gm if it is found at height 10 m from the ground. (acceleration of gravity = 10 m/s^2.)

Question 3

A Put (✓) or (✗) and correct the wrong ones :

1. Electron transfers from (N) energy level to (K) by gaining quantum. ( )
2. Euglena from multicellular living organisms. ( )
3. The transfer of heat through copper is by conduction. ( )
4. Angiosperms are called flowering plants. ( )
5. When the ball of pendulum goes away from its original position, its kinetic energy increases. ( )
6. At mid height divide (K.E.) over (P.E.) of object = 1 ( )

PART 3

B **What will happen if ... ?**

1. The legs of camel do not end with thick flat pads.
2. The mass number equals the atomic number in the nucleus of an atom of an element.
3. You add 100 cm^3 of ethyl alcohol to 400 cm^3 of water.
4. Overuse of chemical pesticides.

C **Mention the formula by which you can :**

1. Calculate the number of electrons that saturates each energy level from one to four.
2. Show relation between mechanical energy, kinetic energy and potential energy.

Question 4

A **Choose the correct answer :**

1. Nucleus of atom is .... charged.
   a. positively b. negatively c. neutrally d. all are right
2. .... belongs to animals that have no body support.
   a. Mussel b. Hedgehog c. Octopus d. Snake
3. In the solar cell, the solar energy is directly converted into .... energy.
   a. kinetic b. light c. electric d. heat
4. Distance among molecules are very small in ....
   a. water. b. copper. c. hydrogen. d. oil.
5. Birds migration represents .... adaptation.
   a. anatomical b. functional c. structural d. behavioural
6. By increasing the height to double and decreasing the mass of an object to half the potential energy will ....
   a. increase to double. b. decrease to half. c. not change. d. increase four times.

B **Choose the odd word out, then write the scientific term for the other words :**

1. Iron – Copper – Aluminium – Wood.
2. Dieonea – Drosera – Amoeba – Halophila.
3. Whale – Bat – Dolphin – Sea lion.
4. Spiders – Locusts – Flies – Cockroaches.

C **Give the difference between :**

1. Solid material and gaseous material
   (Concerning : intermolecular space, intermolecular force).
2. Electric heater and solar heater
   (Concerning : effect on the environment and kind of energy resource).

17 El-Dakahlia Governorate

Educational Directorate
Scienec Inspectorate

Answer the following questions :



Question 1

A Choose the correct answer :

1. The measuring unit of density is ....
   a. m/s. b. gm/cm^3 c. kg/s.
2. .... is from the compound molecules.
   a. Cl_2 b. H_2O c. Fe
3. .... is from the inert gases.
   a. He b. Al c. Cl
4. The number of electrons that saturates the level (K) is ....
   a. 8 b. 2 c. 32
5. Resource of permanent energy is ....
   a. petrol. b. the Sun. c. coal.
6. Dynamo converts mechanical energy into .... energy.
   a. electric b. nuclear c. solar
7. .... haven't a body support.
   a. Snails b. Dogs c. Jellyfishes

B Fill in the following table after coping it in your answer sheet :

By knowing that (Mass number = Number of protons + Number of neutrons).

	Atomic number	Mass number	Number of protons	Number of neutrons
Hydrogen	1	1	....	....
Calcium	20	....	....	20
Carbon	....	12	....	6
Chlorine	....	35	17	....

C Mention the formula (law) by which you can determine :.

1. The number of electrons in each energy level.
2. The work done.
3. The weight of an object.

PART 3

Question 2

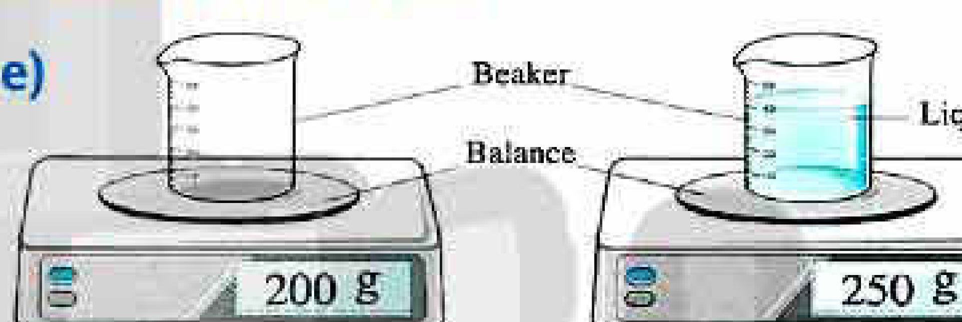
A Put (✓) or (✗) with correcting the false ones :

1. Water is used to put out petrol fires. ( )
2. Mass number is the number of neutrons in the nucleus. ( )
3. Wood and copper are bad conductors of electricity. ( )
4. Chemical energy can be stored in stretched spring. ( )
5. Fuel in a car as food for a man. ( )
6. The measuring unit of potential energy is the joule. ( )
7. The hydrogen molecule consists of two hydrogen atoms. ( )

B The diagram shows an experiment to find the density of a liquid

By using the formula (Density = Mass/Volume)

Calculate the density of the liquid.





C Give reasons for :

1. The atom is electrically neutral.
2. The mass of the atom is concentrated in its nucleus.
3. Freezer is found at the top of the fridge.
4. Cooking pots are made up of aluminium.

Question 3

A Write the scientific term :

1. The number of positive protons in the nucleus.
2. The ability to do work, or to make a change.
3. The simplest pure form of matter which can't be analyzed simpler.
4. The matter which doesn't take the shape of the container.
5. Amount of energy which an electron loses or gains to transfer from an energy level into another one.
6. Temperature at which solid state begins to change into liquid one.
7. A modification in behaviour, structure or biological function of living organisms to become more adapted with the environmental conditions.

B Write the electronic configuration of the following atoms : $^{39}_{19}K$ - $^{7}_{3}Li$ - $^{19}_{9}F$ - $^{40}_{18}Ar$

C **Fill in the following table after copying it in your answer sheet :**

(Heat energy - Wind - Food - Sound energy- Electric energy -The Sun).

Energy forms	Energy resources
....	....
....	....
....	....

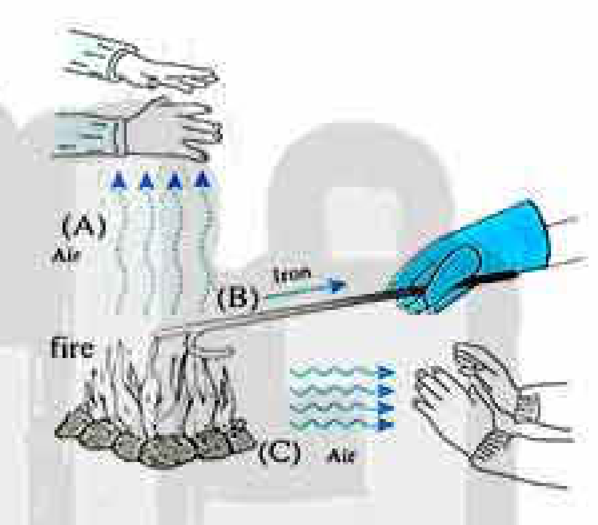
Question 4

A **Problem :**

A ball was launched upwards and vertically at a speed 3 m/s up to a height 4m. Calculate the mechanical energy of the ball if its weight is 5 newtons and has a mass 0.5 kg.

B **Write the name of each chemical symbol of the following:**

1. P 2. Ne 3. Si 4. N



C **Study the figure, then mention :**

Heat transfers through different media by : (conduction, convection and radiation). Mention the method of transferring heat in each area (A, B, and C).

D **State one difference between :**

1. Potassium and gold. (Concerning chemical activity)
2. Insects and arachnids. (According to the number of legs)
3. Solid and gas. (Concerning the intermolecular spaces)
4. Hydrogen and Helium. (According to the number of atoms in its molecule)

18 Ismailia Governorate — Science Inspectorate

Answer the following questions :

Question 1

A **Complete the following statements :**

1. The liquid element which consists of one atom is called ....
2. An example for a very active metal is ....
3. Friction turns kinetic energy into .... energy.





PART 3

4. The whale front limbs are modified into ....
5. The simple cell consists of .... solution and two different metals.
6. The electrons have .... charge.
7. .... is from the plants that reproduce by spores.
8. Kinetic energy increases by increasing speed and ....

B Give reasons for the following :

1. The heater is put at the bottom of the room.
2. Some animals hibernate in winter.
3. The electrons are distributed to fill the (K) level before filling the (L) level.
4. The front teeth of hedgehog are extending outwards.

C When a piece of iron, whose mass is 78 gm is put in a graduated cylinder containing 100 cm^3 water, the water rises to 110 cm^3. Calculate the density of iron.

Question 2

A Choose the correct answer for the following :

1. An object of mass 2 kg is moving at a speed of 4 m/sec. so its kinetic energy is .... joules.
   a. 16 b. 6 c. 8 d. 32
2. The solar heater changes solar energy into .... energy.
   a. chemical b. electric c. kinetic d. heat
3. The Sun is a .... source of energy.
   a. non-renewable b. renewable c. permanent d. all the previous
4. The density of petroleum oil is .... that of water.
   a. less than b. more than c. equal to d. no correct answer
5. Insectivorous plants cannot absorb the nitrogenous substances to make ....
   a. carbohydrates. b. proteins. c. fats. d. vitamins.
6. Secretion of poison in some snakes is an example of ....adaptation.
   a. structural b. behavioural c. functional d. all of them
7. .... is an animal that have no body support .
   a. Octopus b. Snake c. Hedgehog d. no correct answer
8. The figure which represents oxygen molecule is ....
   a. b. c. d.

9. Number of neutrons in the ($^{27}_{13}Al$) is ....

a. 13 b. 27 c. 14 d. 40

10. The transfer of heat with no need for a medium is called ....

a. convection. b. radiation. c. conduction. d. no correct answer.

B How can the following be adapted to their environment :

1. Stick insect to hide from its enemies.
2. Quail bird to overcome the decrease in temperature.

C Calculate the weight of a body whose potential energy is 88 joules and it is at a height of 11 m.

Question 3

A Write the scientific term :

1. Energy is neither created nor destroyed , but it can be changed from one form to another.
2. The ability of some living organisms to simulate the dominant environmental conditions to hide from enemies or capture insects.
3. The amount of energy lost or gained when an electron transfers from one energy level to another.
4. The result of combination between two or more different elements with constant weight ratios.
5. The temperature at which a substance starts to change from the solid state to the liquid state.
6. The smallest part of matter which can exist alone and keep properties.

B Give one example for each of the following :

1. Aestivation in animals.
2. A solid substance which is soft at room temperature.
3. Plants that can't be distinguished into roots, stems and leaves.
4. A bird whose beak is wide indented in the two sides.

C Put (✓) in front of right statement and (✗) in front of wrong one :

1. Heat is transferred in solids by conduction. ( )
2. The intermolecular forces are very strong in gases. ( )
3. In the car dynamo , electric energy is changed into kinetic energy. ( )
4. Bean plant is a dicotyledon plant. ( )

PART 3

Question 4

A Complete the following table :

Symbol	Element name	Atomic number	Electronic configuration			Activity
			K	L	M	
$_{11}Na$	....	....	2	8	1	....
$_{10}Ne$	Neon	....	....	....	....	....
$_{12}Mg$	....	12	....	....	....	Active

B Compare between : insects and arachnids (number of legs only).

C Examine the figures , then complete the sentences :

1. The maximum potential energy is in point(s) .... , while the maximum kinetic energy is at point(s) ....

(B) (A) (C)

2. The figure represents the gaseous material is .... , while the figure represents the liquid material is ....

(1) (2) (3)

19 Port-Said Governorate — El-Qadessia Language School

Answer the following questions :

Question 1

A Complete the following phrases :

1. Scolopendra belongs to ...., whereas spider belongs to ....
2. Jewels are made up of .... alloy, while heating coils are made up of .... alloy.
3. The nitrogen molecule consists of ...., while the argon molecule consists of ....
4. When a body raised up, the potential energy ...., while the kinetic energy ....

B An object has a kinetic energy 64 joules and moving at a speed 4 m/s. Find the object mass.

C Give reasons for the following :

1. The atom is electrically neutral.
2. Camel limbs end in a thick flat pad.
3. Heater is put at the bottom of the room.



Question 2

A Write the scientific term for each of the following statements :

1. The basic classification unit for living organisms.
2. The amount of energy that gained or lost by the electron to transfer from an energy level to another.
3. The temperature at which a solid substance starts to change into liquid.
4. Energy is neither created nor destroyed, but it is converted from one form to another.

B When a piece of copper of mass 156 gm is put in a graduated cylinder containing 100 cm^3 of water, the reading of cylinder becomes 120 cm^3. Calculate the density of copper.

C Compare between :

1. Solids and liquids. (According to attraction force)
2. Bean and pine plants. (According to seeds)
3. Heat energy and temperature. (Concerning : definition)

Question 3

A Write down the electronic configuration of the following elements :

1. $_{11}Na$ 2. $_{17}Cl$ 3. $_{10}Ne$

B What happens when ... ?

1. Using water in putting out petrol fires.
2. Camel exchanges its pad with a horse's hoof.
3. Friction between a tire of a bicycle and a rough surface.
4. An electron gains a quantum of energy.

C Put (✓) in front of the correct statement and (✗) in front the incorrect one , then correct the wrong ones :

1. Aestivation is the behaviour that some animals do by hiding in burrows to avoid low temperature in winter. ( )
2. The mass number is the number of protons and electrons. ( )
3. Potential energy of an object decreases by increasing its height. ( )
4. The motion of gases is completely free. ( )

Question 4

A Choose the correct answer :

1. The following animals have no body support except ....
   a. worms. b. octopus. c. jellyfish. d. fish.

PART 3

2. .... reproduces by spores.

a. Vougheir b. Pine c. Bean d. Wheat

3. As an object falls downwards, ...

a. the potential energy increases.
b. the kinetic energy increases.
c. the mechanical energy is lost.
d. the speed of the object decreases.

4. When atomic number of an element equals its mass number, this means that there aren't .... in the nucleus of this element.

a. electrons b. protons c. neutrons d. photons

B Mention the formula by which you can :

1. Calculate the number of electrons that saturates each energy level.
2. Show the relation between mechanical, kinetic and potential energies.

C Look at the opposite figure, then answer :

1. Mention the name of the opposite.
2. Label the figure.
3. This device changes .... energy into .... energy.

20 Damietta Governorate — Damietta Official Language Schools

Answer the following questions :

Question 1

A Complete :

1. Silver symbol is ...., whereas sulphur symbol is ....
2. Hawks have .... beaks to tear the prey, whereas ducks have .... beaks to filter food from water.
3. The liquid element that its molecule is composed of one atom is .... , while that composed of two atoms is ....
4. An object of mass 2 kg is moving at a speed of 4 m/s has a kinetic energy ....
5. Electric energy is converted into kinetic energy in ....
6. .... and .... are teethless mammals.
7. The number of energy levels in the largest known atom is ....
8. Electric cables are made up of ....

B Compare between :

1. Melting point and boiling point.
2. Scorpion and bee (According to the number of legs).

Question 2

A Choose the correct answer :

1. An object of 20 N weight is placed at 5 m height, it has potential energy ....
   a. 50 J. b. 100 J. c. 150 J.
2. From animals with internal support : ....
   a. octopus. b. snails. c. fish.
3. Positive charged particles in the nucleus of atom are ....
   a. neutrons. b. protons. c. electrons.
4. Potassium is symbolized by ....
   a. P b. K c. B
5. From gymnosperms plants : ....
   a. wheat. b. pine plant. c. maize.
6. Density measuring unit ....
   a. cm^3. b. gm. c. gm/cm^3.
7. In the solar batteries the solar energy is directly converted into .... energy.
   a. light b. sound c. electric
8. Heat is transferred by radiation through ....
   a. liquids only. b. gases only. c. material media and non-material ones.

B (1) Write the electronic configuration of :

$^{23}_{11}Na$ $^{27}_{13}Al$

- Then determine each of the following :
  1. Atomic number.
  2. Mass number.
  3. Number of neutrons.

(2) What is meant by the following ... ?

- Mechanical energy of an object is 100 joule.

Question 3

A Give reasons for :

1. Water is not used in extinguishing petrol fires.
2. Camel limbs ends in a flat thick pad.
3. It is difficult to bend iron rod.
4. Inert gases cannot share in chemical reaction in ordinary conditions.
5. The heater is placed on the ground.



PART 3

B Give one different between each of the following :

1. Bean plant and maize plant. 2. Insects and arachnids.

C (a) Identify :

1. Energy. 2. Quantum. 3. Adaptation.

(b) Mention one example for :

1. A good conductor matter for heat and electricity.
2. Plants that reproduce by spores.

Question 4

A Write the scientific term :

1. Energy is neither created nor destroyed, but it can be transformed into another form.
2. Mass measuring unit.
3. Temperature at which liquid state changes into gaseous one.
4. It is the smallest part in matter that can exist freely, having the properties of a substance.
5. An alloy which is used in making heating coils.
6. The simplest pure form of matter and cannot be analyzed into simpler form.

B Rewrite the following sentences after correcting the underlined words :

1. Carbon is symbolized by **Ca**.
2. Animals with external support are such as **reptiles**.
3. Friction turns **potential** energy into heat energy.
4. From substances that float on the surface of water is **copper**.
5. Resource of permanent energy is **nuclear energy**.
6. Aluminium is from **liquid** elements.

C Cross out the unsuitable word from each of the groups below :

1. Locust - Mosquito - Spider - Cockroach - Flies.
2. Lion - Tiger - Dog - Wolf - Armadillo.

21 El-Behira Governorate — Ismail Elhabrouk Formal Language School

Answer the following questions :

Question 1

A Choose the correct answer :

1. The monoatomic liquid is ....

a. Hg b. Ag c. Mg d. Br

2. The heat of the Sun is transferred to us by ....

a. convection.
b. radiation.
c. conduction.
d. conduction and radiation.

3. The rule which is used to find the electronic configuration for the first four energy levels is ....

a. 2^2n
b. $2n^2$
c. 2n
d. n^2

4. From gymnosperms plants is ....

a. wheat.
b. pine.
c. maize.
d. pea.

5. An object of mass 1 kg moves at speed 4 m/s., so it has a kinetic energy = ... joule.

a. 16
b. 8
c. 64
d. 4

6. When atomic number of an element equals its mass number, this means that there aren't .... in the atom of this element.

a. electrons
b. protons
c. neutrons
d. photons

B Give reasons for each of the following :

1. When a zebra mates a donkey, they can't produce fertile individuals.
2. The volume of a mixture of water and alcohol is less than the sum of their volumes before mixing.
3. There are front teeth extending outward in hedgehog .
4. Balloons which filled with helium gas rise up in air.

Question 2

A Write the scientific term for each of the following :

1. It is the atom which gains a quantum of energy.
2. The basic classification unit for living organisms.
3. The simplest pure form of matter which can't be analyzed chemically into simpler form.
4. It is the heat condition which determines whether heat transfers from or to an object when it comes in contact with another.

B Mention one use or importance for each of the following :

1. Nickel-chrome alloy.
2. Solar cell.
3. Palm legs in ducks.
4. Stainless steel alloy.

C Find the number of neutrons, number of electrons and its chemical activity for each of the following atoms :

1. $^{27}_{13}Al$
2. $^{20}_{10}Ne$



Question 3

A Complete the following statemetns :

1. .... solution is a good conductor of electricity, but .... solution is a bad conductor of electricity.
2. Simple cell converts .... energy into .... energy.
3. Spiders are classified from .... but .... is classified from myriapods.
4. Potassium $_{19}K$ has .... electron/s in the outermost energy level, but $_{18}Ar$ has .... electron/s in the outermost energy level.

B What do you expect in each of the following cases ... ?

1. Predatory plants can't capture insects.
2. Increasing mass of an object. (Concerning its density)
3. Friction between bicycle wheels and a rough surface.

C Study the opposite figure which represents :

The volume of water before and after put a stone on it.

Find the density of this stone if its mass = 80 gm?

60 cm³

100 cm³




Question 4

A Correct the underlined words in the following statements :

1. The atom mass is concentrated inside the **electrons**.
2. Measuring unit of weight is **joule**.
3. In rodents the incisors number in the lower jaw is **three pairs**.
4. **Gold** is from very active metals.

B Compare between :

1. Ammonia gas and hydrogen chloride. (in terms of : no. of elements - no. of atoms)
2. Hibernation and aestivation. (in terms of : definition - example)

C Two players play volley ball, If the mass of the ball is 1.5 kg and gravity is 10 m/s^2., Find :



1. Potential energy at position (1) that represents the maximum height, if the net at height = 2m.
2. Mechanical energy at position (2) that represents the ground.

22 El-Minia Governorate
Minia Directorate
Kafr El-Mansoura Language School

Answer the following questions :

Question 1

A Complete the following sentences :

1. .... and .... are teethless mammals.
2. Light posts in streets are painted from time to time to protect them from ....
3. An object of 20 N weight is placed at a height of 5 m, has potential energy equals ....
4. An alloy of .... is used in making jewels, while an alloy of .... is used in making heating coils.

B Write the chemical symbols of :

1. Sliver. 2. Calcium. 3. Aluminium. 4. Helium.

C State one difference between :

1. A rabbit and a squirrel. 2. An element and a compound.

Question 2

A Choose the correct answer :

1. The property of electric conduction is distinguishing factor between ....
   a. iron and copper. b. wood and plastic. c. iron and wood. d. plastic and glass.
2. The scorpion belongs to ....
   a. insect. b. myriapods. c. arachnids. d. mammals.
3. Heat transfers from heater by ....
   a. conduction and radiation. b. radiation and convection.
   c. conduction and convection. d. radiation only.

B Give reasons for :

1. When adding an amount of water to alcohol the volume of mixture is less than the sum of their volumes before being mixed.
2. The equation ($2n^2$) is not applied on levels higher than 4^{th} level.
3. Wood floats on water surface, while a piece of iron sinks.
4. The freezer is found at the top of the fridge.

C Write the scientific configuration for :

1. $^{24}_{12}Mg$ 2. $^{16}_{8}O$

PART 3

Question 3

A Write the scientific term :

1. Energy is neither created nor destroyed, but it can be transformed into another form.
2. The modification in behaviour, structure or biological function of living organism's organs to become more adapted to the environmental conditions where it lives.
3. Energy gained or lost to transfer an electron from one energy level to another.

B On determining iron density using a piece of iron of mass 78 gm the piece immersed in 100 cm^3 of water, the water increases up to 110 cm^3. Calculate iron density .

C What happens if ... ?

The camel exchanges its pad with horse's hoof.

Question 4

A Put (✓) or (✗) :

1. The positive pole in the simple cell is lead. ( )
2. The motion of gaseous molecules is limited. ( )
3. Neutrons are found inside the nucleus and carries positive charges. ( )

B Mention one example for :

1. Solid substance has low melting point.
2. Camouflage in insect.

C What's meant by ... ?

1. Melting point.
2. Mechanical energy.

23 Assiut Governorate — Governmental Language Schools

Answer the following questions :

Question 1

A Write the scientific term for each of the following sentences :

1. Number of the positive protons in nucleus of the atom.
2. Energy stored in the object due to the work done on the object.
3. Energy gained or lost to transfer an electron from an energy level to another.
4. The basic unit of classification in living organisms.
5. Imaginary places in which electrons can move according to their energies.
6. It is the mass of unit volume of the substance.

B **Mention one example of each of the following :**

1. Very active element.
2. Device converts electric energy into light energy and heat energy.
3. Liquid element its molecule consists of one atom.
4. Permanent source of energy.
5. Species of birds adapted by bird migration.
6. Mammals have paddles for swimming.

C **Compare between each of the following :**

Rodents and lagomorphs. (According to number of teeth in the upper jaw - example).

Question 2

A **Give reasons for :**

1. It is very hard to fragmentize a piece of iron with your fingers.
2. The atom is electrically neutral.
3. Hedgehog has front teeth extending outwards.
4. Neon atom ($_{10}Ne$) does not enter a chemical reaction through the ordinary conditions.

B **Choose the correct answer :**

1. The property of electric conduction is a distinguishing factor between : ....
   a. iron and copper. b. wood and plastic.
   c. iron and wood. d. copper and aluminium.
2. As doubling height to which an object is raised from ground, so the ....
   a. kinetic energy is increased to its double value.
   b. potential energy is increased to 3 times.
   c. potential energy is increased to its double value.
   d. mechanical energy is increased to 4 times.
3. Energy is neither created nor destroyed, but it can be transformed into another form of energy, this law is known as law of...............
   a. conservation of energy. b. conservation of matter.
   c. kinetic energy. d. Earth's gravity.
4. The scorpion belongs to ....
   a. insects. b. myriapods. c. arachnids. d. mammals.
5. Mechanical energy is converted into heat energy by means of ....
   a. electric generator. b. electric heater.
   c. friction among moving particles with each other. d. electric motor.





PART 3

6. The symbol which represents silver element is ....

a. S b. Si c. Au d. Ag

7. .... are from the animals which don't have a body support.

a. Reptiles b. Snails c. Jellyfishes d. Birds

8. Pea plant belongs to .... plants.

a. fern b. monocotyledon c. dicotyledon d. gymnosperm

Question 3

A Complete the following :

1. An alloy of .... is used in making jewels, while an alloy of .... is used in making heating coils.
2. .... and .... are teethless mammals.
3. Heat is transferred through solids by ....
4. .... is from the plants that reproduce by the formation of spores whereas .... is from the plants that produce seeds inside cones.
5. The product that results from a combination of atoms of different elements with constant weight ratios is ....
6. .... and .... are used in classifying plants.

B If the mass of an empty glass beaker 75 gm, and the mass of a beaker containing liquid 135 gm and the volume of the liquid measured by graduated cylinder 100 cm^3. Find the density of this liquid.

C Give an example to show the adaptation of the following living organisms with the environmental conditions :

1. Duck. 2. Dieonea plant.

Question 4

A Put (✓) or (✗) in front of the following sentences and correct the wrong one :

1. Temperature is directly proportional to the kinetic energy of the particles. ( )
2. Convection is a way, which the heat is transferred through gases and space. ( )
3. Neutrons are particles, which are negatively charged of negligible mass and revolve around the nucleus. ( )

B What is meant by the following ... ?

1. Heat energy.
2. Melting point.

C **A stone of 3 kg mass falls from 6 m height, what is its potential energy? And what is its kinetic energy? In each of the following :**

1. At the start of falling.
2. At height 2 m.
3. On reaching ground. (considering gravity acceleration = 10 m/sec^2)

D **Study the following atoms, then answer :**

Points of comparison	$^{35}_{17}Cl$	$^{4}_{2}He$
1. Number of electrons in outermost energy level of each atom.	....	....
2. Number of neutrons inside nucleus of each atom.	....	....
3. Number of energy levels which have electrons of each atom.	....	....



24 Luxor Governorate — Science Inspectorate

Answer the following questions :

Question 1

A **Choose the correct answer :**

1. .... is the monoatomic liquid molecule.
   a. Bromine b. Mercury c. Iodine
2. .... is an example of plants that reproduce by seeds.
   a. Adiantum b. Vougheir c. Bean
3. By increasing the kinetic energy of particles, their .... increases.
   a. weight b. temperature c. volume
4. The electric energy is converted into kinetic energy in ....
   a. electric lamp. b. electric fan. c. electric heater.
5. .... bird migrates in winter.
   a. Quail b. Duck c. Sparrow

B **What is meant by ... ?**

1. Micro-organisms.
2. Conservation law of energy.

C **Write the symbol of each one of the following elements :**

1. Gold .... 2. Sodium .... 3. Oxygen ....
4. Carbon .... 5. Phosphorus ....





PART 3

Question 2

A Complete the following statements :

1. The nucleus of the atom contains .... and ....
2. The intermolecular spaces among solid molecules are.............. but .... in gases.
3. In photosynthesis process, ... energy changes into .... energy.
4. Heat is transferred in three methods which are .... , ... and ....
5. .... , ... and .... are examples of insectivorous plants.

B Cross out the odd word :

1. Extinction - Aestivation - Hibernation - Birds migration.
2. Amoeba - Euglena - Clover - Paramecium.

Question 3

A Put (✓) or (✗) with correcting the false ones :

1. Water molecule is composed of two atoms of two elements. ( )
2. Equal masses of different substances have the same volumes. ( )
3. Hedgehog has front teeth extending outwards. ( )
4. Scorpion and spider are from arachnids. ( )
5. When a stone falls down, its kinetic energy decreases. ( )

B Write the scientific term for each of the following :

1. The amount of energy gained or lost to transfer an electron from an energy level to another.
2. The stored energy in an object due to the work done on it.
3. The basic classification unit of living organisms.

C Give reasons for :

1. The atom is electrically neutral.
2. You feel warm when you rub your hands together in winter.
3. When a zebra mates a donkey, they can't produce fertile individuals.

Question 4

A Mention two examples of each of the following :

1. Animals with soft bodies : .... , ...
2. Camouflage : .... , ...

B Write the electronic configuration of the following atoms, then calculate the number of neutrons in each atom :

1. $^{24}_{12}Mg$ 2. $^{40}_{18}Ar$

C Problems :

1. The density of alcohol is 0.8 gm/cm^3. Find the volume of 80 gram of it.
2. Find the potential energy of an object, whose mass is 6000 gram when it is found at a height of 10 m from the ground. (gravity acceleration = 10 m/s^2).

25 Aswan Governorate — M.M.Yaakoub Formal Language School

Answer the following questions :

Question 1

A Complete the following sentences :

1. The hydrogen molecule consists of ...., while the helium molecule consists of ....
2. Friction turns ....energy into .... energy.
3. Heat transfers by convection in .... and ....
4. .... and ....are from plants that reproduce by spores.
5. The frog is an example for .... , while jerboa is an example for ....

B Calculate :

The kinetic energy of an object its mass is 2 kg and moving at a speed of 5 m/s.

Question 2

A Choose the correct answer :

1. Silver is symbolized by ....
   a. Hg b. Au c. Ag d. Cu
2. Attraction force between solid molecules is ....
   a. large. b. small. c. very small. d. not found.
3. The number of energy levels in the heaviest atom is ....
   a. 7 b. 8 c. 18 d. 32
4. Resource of permanent energy is ....
   a. The Sun. b. Coal. c. Petrol. d. Nuclear reactions.
5. The cockroach belongs to ....
   a. insects. b. myriapods. c. arachnids. d. mammals.

B Give reasons for :

1. Atom is electrically neutral.
2. Some plants pounce insects.



Question 3

A Write the scientific term for each of the following :

1. The temperature at which a matter changes from a liquid state into gaseous one.
2. The smallest individual unit of matter which can share in a chemical reaction.
3. Energy is neither created nor destroyed, but it is transformed into another form.
4. A modification in behaviour, structure, biological function of a living organism's organs to be more adjustable with the environmental conditions where it lives.
5. The ability of some living organisms to be hidden from their enemies or preys.



B Mention the formula by which you can calculate :

1. The density.
2. The number of electrons in each energy level.

Question 4

A Choose from (B) what suits it from (A) :

(A)	(B)
1. Julius	a. Insect
2. Scorpion	b. Rodent
3. Sloth	c. Myriapod
4. Rat	d. Lagomorph
5. Rabbit	e. Arachnid
	f. A teethless mammal

B Write the electronic configuration of the following atoms :

1. $^{27}_{13}Al$
2. $^{40}_{18}Ar$



26 South Sinai Governorate — Tur Sinai Directorate

Answer the following questions :

Question 1

A Complete :

1. Protons are particles with .... charges, while electrons are particles with .... charges.
2. Potential energy = ... × ....

3. An alloy of .... is used in making jewels, while an alloy of .... is used in making cooking pots.
4. Hawks have .... beaks, while ducks have .... beaks.
5. Heat transfers through solids by ...., while through non-material media by ....

B Compare between :

1. Element and compound (According to definition only).
2. Insects and arachnids (According to number of legs- examples).

C Study the opposite figure then :

1. Mention the name of the opposite device.
2. Label the figure.
3. Write the change of energy in this device.

(3) (1) (2)

D Write one importance of :

1. The front teeth in hedgehog.
2. Helium gas.

Question 2

A Choose the correct answer :

1. The number of atoms is equal to the number of elements in .... molecule.
   a. water b. hydrogen chloride c. oxygen
2. Among elements which has a great difficulty to react with oxygen of air is ....
   a. potassium. b. sodium. c. gold.
3. The activity of birds during the daylight and bats during night is considered as an example of .... adaptation.
   a. functional b. anatomical c. behavioural
4. When an object is thrown upwards its ....
   a. potential decreases. b. speed decreases. c. mechanical energy decreases.
5. In car dynamo the energy changes from ....
   a. heat to mechanical. b. electric to heat. c. mechanical to electric.

B Study the opposite figure which represents the nucleus of an element, then find :

1. The mass number.
2. The number of energy levels having electrons.
3. This element active or inactive? Give reason for your chosen.

+19
±20

C Write an example of :

1. Liquid element composed of two atoms.
2. An insectivorous plant.

PART 3

D **Write the chemical symbols of the following elements :**

1. Silver. 2. Iron 3. Phosphorus 4. Sodium

Question 3

A **Write the scientific term :**

1. Elements react with atmospheric oxygen when they are exposed to humid air.
2. The smallest part of matter which can exist in a free state and keep the properties of matter.
3. Energy is neither created nor destroyed, but it is converted from one form to another.
4. Plants that can't be distinguished into roots, stems and leaves.
5. The ability of some living organisms to be hidden from their enemies or to capture the preys in the predatory species.

B **Cross out the odd word and write the scientific term of others :**

1. Iron - Copper - Aluminium - Plastic.
2. Amoeba - Paramecium - Vougheir - Euglena.
3. Convection - Melting - Radiation - Conduction.

C **A graduated cylinder contains 100 cm^3 from a liquid its density 0.8 gm/cm^3. Calculate :**

1. The liquid mass. 2. The volume of 4 gram of the same liquid.

Question 4

A **Put (✓) or (✗) ,then correct the wrong one :**

1. The volume of a mixture of water and alcohol is equal to the sum of their volumes before mixing. ( )
2. The chemical reaction takes place between atoms according to the number of electrons in their outermost energy levels. ( )
3. Chemical pesticides cause electromagnetic pollution for water, air, and soil. ( )
4. Birds and mammals have external support. ( )
5. The horse hoof ends in a thick flat one to help horse go through the rocky soil. ( )

B **Give reasons for :**

1. Pine plant is a gymnosperm.
2. The fuel inside the car is similar to the food inside the body of living organisms.
3. It is easy to shape metals, while it is difficult to shape sulphur.
4. Bat can fly although it is from mammals.

C **Two objects, object (A) its mass 8 kg at 6 m height from the Earth's surface, and object (B) of weight 50 N at 10 m from the Earth's surface, which of the two objects store more potential energy. (Given that gravity acceleration = 10 m/s^2).**

Final Examinations 2020

PART 3



Final Examinations of some Governorates.

1 Cairo Governorate — Nozha Language Schools

Question 1

A Complete the following statements :

1. .... and .... are considered as forms of energy.
2. The oxygen molecule consists of two .... atoms, while the ammonia molecule consists of one .... atom and three hydrogen atoms.
3. Limbs are modified into wings in bats for ...., while into paddles in whales and dolphins for .... in water.
4. The attraction force among the molecules of copper is .... than that between molecules of water.
5. Scorpion has .... pairs of legs, while ants have .... pairs of legs.
6. The heat transfers by convection through .... and .... materials.

B Cross the odd word out :

1. Aluminium / Sulphur / Copper / Iron.
2. Jellyfish / Armadillo / Earthworm / Octupus
3. Helium / Oxygen / Neon / Argon.

Question 2

A Choose the correct answer :

1. The atom is electrically ....
   a. positive. b. neutral. c. negative.
2. .... are from animals that have an external support.
   a. Mammals b. Snails c. Birds
3. The produced energy by burning the fuel is .... energy.
   a. potential b. nuclear c. heat
4. The volume of a mixture of 300 cm^3 of water and 200 cm^3 of ethyl alcohol is .... 500 cm^3.
   a. less than b. more than c. equals
5. Secretion of poison in the snakes is a .... adaptation.
   a. structural b. functional c. behavioral



6. The number of electrons that saturates an energy level (n) = ...

a. n^2 b. 2n c. $2n^2$

7. The electric cell is composed of .... solution with two different metals dipped in.

a. a salt b. an alkali c. an acid

B Put (✓) or (✗) :

1. As we go further from the nucleus, the energy of the energy level decreases. ( )
2. The heat transfers from the lower temperature object to the higher temperature object. ( )
3. Mercury is a liquid element that its molecule composed of one atom. ( )
4. Chemical pesticides and car exhaust are from the harms of technology applications. ( )
5. Scolopendra and euglena are from myriapods. ( )

C Write the importance of each of the following :

1. Gold-copper alloy 2. Car dynamo.

Question 3

A Correct the underlined words :

1. The symbol of copper is Ca while F is the symbol of phosphorous.
2. Frogs undergo aestivation in winter to overcome the decreasing of temperature.
3. Boiling point is the temperature at which matter changes from solid into liquid state.
4. Friction changes the potential energy into electric energy.
5. Wood is a good conductor of heat and electricity.
6. The mechanical energy is the sum of heat energy and light energy.
7. The density equals mass divided area.

B Give reasons for :

1. Camel's legs end in a broad pad and thick skin.
2. Argon atom ($_{18}Ar$) doesn't enter a chemical reaction through the ordinary conditions.

C Calculate the potential energy of an object of weight 50 newtons that placed at height 5 metres.

Question 4

A Write the scientific term :

1. The smallest individual unit of matter which can share in chemical reaction.

2. It is a modification in the living organism body structure, function or behavior to be adapted with its environmental conditions.

3. It is a permanent resource of energy.

4. An amount of energy that gained or lost to transfer an electron from one energy level to another.

5. The way of transferring the heat through solids.

B **The figure represents the electronic configuration of the atom of an elements Determine :**

1. The atomic number.
2. The mass number.
3. The number of energy levels.
4. The number of electron in the last energy level.

C **Match from column (B) what is suitable for column (A) :**

(A)	(B)
1. Chameleon	a. reproduce by formation of spores.
2. Voughair	b. colours itself with the dominant colours of surrounding environment to capture the prey.
3. The jerboa	c. from the insectivorous plants.
4. Drosera	d. undergoes aestivation in summer to escape from high temperature.
5. Rat	e. is an example of rodents.

2 Cairo Governorate — Lycee Bab El Louk

Answer the following questions :

Question 1

A **Complete the following statements :**

1. The matter in .... state has a definite shape and definite volume.
2. Technology has negative effects like ....
3. An alloy of .... is used in making jewels.
4. In the simple electric cell, ... energy is converted into .... energy.



5. The pendulum can convert potential energy into .... energy.

6. Activity of bats during night is considered .... adaptation.

B Identify :

1. Species. 2. Melting point.

Question 2

A Correct the underlined words :

1. If the density of a matter is 2 g/cm^3 and its volume is 50 cm^3 , the mass equals **25** g.
2. Heat is transferred through the space by **conduction**.
3. Water molecule is consisted of one oxygen atom and two **nitrogen** atoms.
4. Molecules of liquid element consisted of one atom is the **bromine**.
5. Intercellular spaces among molecules of solid state are **medium**.
6. From plants reproduce by formation of spores **palms** plant.

B Give reasons for :

1. Piece of iron sinks in water.
2. Camel's legs has flat pad.

Question 3

A Choose the correct answer to complete the following statements :

1. Rat has ....
   a. two pairs of incisors in each jaw. b. one pair of incisors in each jaw.
   c. three pairs of incisors in each jaw. d. no correct answer.
2. The Sun is ....
   a. resource of permanent energy. b. resource of non-permanent energy.
   c. not an energy resource. d. (a) and (c).
3. In the radio cassette inside the car the ....
   a. electric energy is converted into mechanical energy.
   b. light energy is converted into heat energy.
   c. electric energy is converted into kinetic energy.
   d. electric energy is converted into sound energy.
4. Atom symbol of potassium element is ....
   a. Hg b. Cu c. P d. K

5. Some substances need heat to get soften such as ....

a. coal. b. iron. c. sulphur. d. rubber.

6. Secreting sweat by skin is considered .... adaptation.

a. structural b. functional c. behavioral d. no correct answer

B **Write the electronic configuration of the following atoms :**

1. $_{11}Na$ 2. $_{10}Ne$

Question 4

A **Calculate the potential energy of an object its mass is 4 kg. is placed at 5 m. height (consider g = 10 m/s^2).**

B **Mention only one difference between**

1. Element and compound. 2. House fly and scorpion. 3. Electron and proton.

C **What happens in each of the following cases ... ?**

1. When the energy of the electron is more than the energy level in which the electron rotates.
2. The freezer is found at the lower part of the fridge.
3. Friction between the frames of bicycle's wheel with the brake.

3 Cairo Governorate — Notre Dame Des Apotres School Shoubra

Answer the following questions :

Question 1

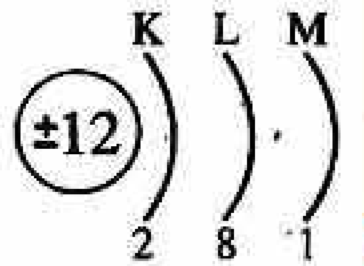
A **Complete the following sentences :**

1. The hydrogen molecule consists of ...., while the argon molecule consists of ....
2. The density is the .... of unit volume of substance and its measuring unit is ....
3. .... and .... are used in classifying plants.
4. When the speed of the pendulum is maximum the .... energy is maximum and .... energy is minimum.
5. Simple electric cell changes .... energy into .... energy.
6. The cockroach is from .... but scorpion is from ....

B Calculate :

1. The potential energy of an object whose mass is 10 kg. and placed at 5 m. height from the ground (Considering gravity acceleration 10 m/s^2).
2. Kinetic energy of an object whose mass is 1 kg. and moving at speed of 5 m/s.
3. The mass of piece of sulphur whose volume is 10 cm^3 and its density is 2.1 gm/cm^3.

C Look at the opposite figure, then answer :



1. Find number of protons.
2. Find the mass number.
3. Find the atomic number.
4. Find this element activity.

Question 2

A Give reasons for each of the following :

1. Wood piece floats on water surface, while a piece of lead sinks in it.
2. Equal volumes of different substances have different masses.
3. Camel's legs end with broad pad.
4. Some plants catch and feed on insects.
5. The freezer is found at the top of fridge.
6. The volume of a mixture of water with alcohol is less than sum of their volumes before being mixed together.

B Mention one example for :

1. Solid substance has low melting point.
2. Insectivorous plants.
3. Unicellular organism.
4. Alloy used in making heating coils.

C Write the symbols of the following element :

1. Mercury.
2. Sodium.
3. Lead.
4. Zinc.

D Write electronic configuration for :

1. $_{19}K$
2. $_{9}F$
3. $_{13}Al$
4. $_{10}Ne$

Question 3

A Write the scientific term for :

1. The sum of potential and kinetic energies of a body.
2. The temperature at which matter begins to change from solid to liquid.

3. A group of terrestrial plants that reproduce by formation spores.
4. The number of positive protons in nucleus.
5. The work done during the motion of an object.
6. Invertebrates that are characterized by having number of jointed legs.

B What is the meant by ... ?

1. Aestivation. 2. Quantum. 3. Species. 4. Temperature.

C Correct the underlined words :

1. Heat transfers through solids by **convection**.
2. Work = force × **time**.
3. Bean plant belongs to **gymnosperms** plants.
4. A piece of iron its mass 156 gm. and its volume is 20 cm^3, so its density = **8.7** gm/cm^3.

Question 4

A Choose the correct answer :

1. The colour property distinguishing factor between ....
   a. flour and table salt. b. iron and gold. c. O_2 and CO_2. d. salt and sugar.
2. The molecule of gaseous element that consists of one atom is ....
   a. oxygen. b. hydrogen. c. helium. d. mercury.
3. Heat transfers through liquids by ....
   a. conduction. b. convection.
   c. radiation. d. convection and radiation.
4. From the animals which don't have body support are ....
   a. raptile. b. snails. c. jellyfish. d. mammals.
5. Scorpion has .... legs.
   a. 4 b. 8 c. 44 d. 6
6. The molecule of ammonia consists of .... atoms.
   a. 2 b. 6 c. 4 d. 1

B What happens when ... ?

1. An electron loses an amount of energy.
2. Doubling the weight of an object (concerning its potential energy).
3. Using water in putting out petrol fires.
4. The number of protons changes (To mass and atomic number).

C **Choose the odd word out then write the relation between the rest words :**

1. Lion – Tiger – Wolf – Armadillo.
2. Ice – Wood – Cork – Iron.
3. Reptiles – Fish – Birds – Worms.
4. Na – Cu – Al – Fe.

4 Cairo Governorate — East Nasr City Directorate

Answer the following questions :

Question 1

A **Complete the following sentences :**

1. The measuring unit of density is ...., while the measuring unit of work is ....
2. .... alloy is used in making jewels, while .... alloy is used in making heating coils.
3. Liquid element its molecule is composed of one atom is ...., while that composed of two atoms is ....
4. The attraction force among gaseous molecules is ....
5. .... is the amount of energy gained or lost to transfer an electron from an energy level to another.
6. Armadillo belongs to .... mammals and hedgehog belongs to .... mammals.

B **Give reasons for :**

1. The atom is electrically neutral.
2. On adding 50 cm^3 of alcohols to 50 cm^3 of water the total volume not equal 100 cm^3.
3. Some plants pounce insect.
4. Kinetic energy increases four times as the velocity of the moving body is doubled.

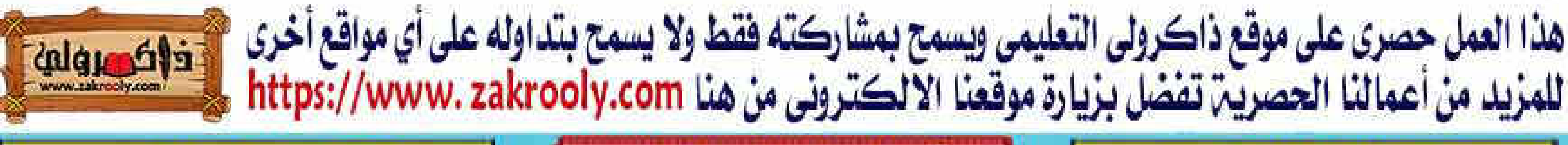
C **What is meant ... ?**

1. Density of water equals 1 gm/cm^3.
2. Mass number of sodium is 23.

Question 2

A **Write the scientific term :**

1. The basic classification unit for living organisms.
2. The simplest pure form of a matter that can't be analyzed into simpler form.



3. The ability to do work or to make a change.
4. Energy is neither created nor destroyed, but it is converted from one form to another.
5. The ability of some living organisms to be hidden from their enemies.

B Compare between :

1. Arachnids and insects. (according to the number of legs).
2. Solids – Liquids and gases. (according to intermolecular space and intermolecular force).

C Calculate the density of iron cube its mass 78 gm. If that piece was immersed in 100 cm^3 of water the level of water rises to 110 cm^3.

Question 3

A Choose the correct answer :

1. Mammal animal that has one pair of incisors in each jaw ....
   a. squirrel. b. rabbit. c. lion. d. no correct answer.
2. The nucleus of .... atom doesn't contain neutrons.
   a. neon b. hydrogen c. oxygen d. no correct answer
3. The atomic number of an atom of an element, its (M) energy level contains 2 electrons is ....
   a. 8 b. 10 c. 12 d. 14
4. Heat transfers by .... through liquid and gas.
   a. conduction b. convection c. radiation d. no correct answer
5. The density of 12 gm. of pure iron is .... the density of 2 gm. of iron.
   a. more than b. equal to c. less than d. no correct answer

B Write the electronic configuration for the following :

1. $^{39}_{19}K$ 2. $^{35}_{17}Cl$ 3. $^{40}_{18}Ar$ 4. $^{7}_{3}Li$

C A force of 20 newton acts on a body to move it a distance 1.5 m. in the same direction of force. Calculate the work done.

Question 4

A Give an example for :

1. An inert gas. 2. Insectivorous plant. 3. Monocotyledon plant.

B Mention the name of the device which used to change :

1. Chemical energy to electric energy.
2. Electric energy to kinetic energy.

C If you have two elements ($^{14}_{7}N$ - $^{24}_{12}Mg$) answer the following :

1. Write the name of each one.
2. The atomic number of each one.

5 Cairo Governorate — Degla Valley Language School

Answer the following questions :

Question 1

A Complete the following sentences :

1. The electron has .... charge, while the proton has .... charge.
2. Heat transfers through solids by ...., while heat transfers through liquids by ....
3. The dynamo converts the .... energy into .... energy.
4. From the examples of dicotyledon plants are .... and ....
5. The front limbs of whales and dolphins are modified into ...., while the front limbs of bats are modified into ....

B What is meant by ... ?

1. The melting point.
2. The law of conservation of energy.

Question 2

A Choose the correct answer :

1. .... is from the animals that make hibernation in winter.
   a. Desert snail b. Jerboa c. Frog
2. .... is a permanent resource of energy.
   a. Sun b. Coal c. Natural gas
3. All of the followings belong to arachnids except ....
   a. locust. b. scorpion. c. spider.
4. The electric lamp changes the .... energy into light and heat energy.
   a. sound b. electric c. mechanical
5. The smell property is a distinguishing factor between ....
   a. iron and gold. b. wood and plastic. c. perfume and vinegar.
6. The energy level N is saturated by .... electrons.
   a. 8 b. 18 c. 32

B Give reasons for :

1. A piece of wood floats on the water surface, while an iron nail sinks in water.
2. Some plants as drosera and dieonea pounce insects.
3. The atom is electrically neutral.

C Calculate the potential energy of an object its mass is 2 kg. at a height 3 m. knowing that the gravity acceleration is 10 m/s^2.

Question 3

A Write the scientific term :

1. The work done during the motion of the objects.
2. The insect which looks like the branches of the plant.
3. The smallest part of matter that can exist freely having the properties of matter.
4. The basic classification unit for living organisms.

B Mention the use of :

1. The copper-gold alloy.
2. The sharp and crooked beaks in hawks.
3. The simple electric cell.

C Draw the electronic configuration of the following atoms :

1. $^{35}_{17}Cl$ 2. $^{27}_{13}Ne$

Question 4

A Correct the underlined words :

1. The molecules of inert gases consist of **two** atoms.
2. Friction turns the mechanical energy into **magnetic** energy.
3. Iron and copper are **bad** conductors of heat.
4. The rat belongs to the **lagomorphs**.
5. The kinetic energy **decreases** by increasing the mass and speed of objects.
6. The chemical symbol of silver is **Si**.

B Mention an example for :

1. A plant reproduces by formation of spores.
2. The liquid element consists of two atoms.
3. A teethless mammal.
4. A solution that is good conductor of electricity.

C Compare between :

1. Insects and arachnids (according to the number of legs).
2. Solids and gases (according to the intermolecular spaces).

6 Cairo Governorate — Dr. Ahmed Zewail Distinguished Language School

Answer the following questions :

Question 1

A Complete the following statements :

1. .... is the positive charges that exists in the nucleus.
2. The intermolecular spaces between iron molecules are ....
3. .... is the way of transferring heat through space.
4. .... is an animal from edentates.
5. .... is the sum of protons and neutrons.
6. .... is the sum of potential and kinetic energy.

B Calculate the mass of piece of sulpher, its volume 5 cm^3 , knowing that the density of sulpher 2.1 gm/cm^3.

C Write the symbol of :

1. Sodium. 2. Calcium. 3. Iron. 4. Fluorine.

Question 2

A Write the scientific term :

1. The temperature at which the substance begin to change from solid to liquid.
2. The monoatomic liquid.
3. The atom that gains a quantum of energy.
4. A device changes solar energy to electric energy.
5. The basic classification unit of living organisms.
6. The plants which devour insects to get protein.

B Give reasons for :

1. The atom is electrically neutral.
2. Neon is an inert gas.



3. Heater is put at the bottom of the room.
4. Spiders are from arachnids.

C Cross the odd word out :

1. Mosquitoes – Scorpion – Ant – Bee.
2. Sound – Heat – Weight – Mechanical.
3. Sugar solution – Salt solution – Acidic solution – Alkali solution.
4. Ammonia gas – Water – Hydrogen – Carbon dioxide.

Question 3

A Choose the correct answer :

1. In simple pendulum P.E at maximum height = ...
   a. K.E. b. zero. c. M.E. d. 10 joules.
2. The third energy level is saturated by .... electrons.
   a. 2 b. 10 c. 18 d. 8
3. .... are from the animals which don't have body support.
   a. Reptiles b. Snails c. Jellyfish d. Birds
4. Heating coils are made up of .... alloy.
   a. iron-copper b. nickel-iron c. chrome-copper d. nickel-chrome
5. .... reproduce by forming spores.
   a. Vougheir b. Pine c. Bean d. Wheat
6. Car engine changes at first chemical energy to .... energy.
   a. heat b. electric c. magnetic d. light

B Find atomic number, mass number, number of neutrons, then make the electronic configuration for $^{39}_{19}K$.

C 1. The name of the opposite device is ....
2. The positive pole is ....
3. The negative pole is ....
4. The liquid in the basin is ....

+ -

Question 4

A Put (✓) or (✗) :

1. The volume of a mixture of 30 cm^3 of water and 20 cm^3 of alcohol is 50 cm^3. ( )
2. Secreting poison in snakes is a behavioral adaptation. ( )

3. Amoeba is from unicellular micro-organisms. ( )
4. The number of the electron in the outermost energy level in $_6C$ is 4 e^- ( )
5. Oxygen gas from monoatomic active gases. ( )
6. Equal volumes of different substances have different masses. ( )

B Calculate the M.E of an object falls downward, at height = 8 m. , its speed was 10 m/sec and its mass = 5 kg knowing that its weight = 49 N.

C Write the classification for :

1. Rabbit. 2. Green algae.

7 Giza Governorate — Sorour Language Schools

Answer the following questions :

Question 1

A Complete the following statements :

1. The liquid that is consists of one atom is ....
2. In dry electric cell, ... energy changes into .... energy.
3. At highest point of the pendulum, the .... energy is maximum.

B Give reasons for :

1. The heater is placed at the ground.
2. It is easy to divide an amount of water into smaller parts.
3. Some plants pounce and digest insects.
4. The equation $2n^2$ is not applied on levels higher than 4^{th} level.

C Write the electronic configuration for each of the following and mention if it is active or inactive :

1. $_{11}Na$ 2. $_2He$ 3. $_{20}Ca$

Question 2

A Write the scientific term :

1. A modification in behavior , structure , biological function of a living organism's organs.
2. Energy is neither created nor destroyed, but it is transformed into another form.
3. The basic classification unit of living organisms.
4. The atom which gains a quantum of energy.

B **Compare between :**

1. Electron and proton (concerning the charge and site).
2. Potential energy and kinetic energy (concerning definition and its value on the ground).

C **If you have two cubes (A) & (B) of wood whose density is 0.5 gm/cm^3 Calculate :**

1. The mass of cube (A) knowing that its volume is 50 cm^3
2. The volume of cube (B) knowing that its mass is 10 gm.

Question 3

A **Put (✓) or (✗) and correct the wrong one :**

1. Gymnosperms are flowering plants. ( )
2. Heat is transferred through solids by conduction. ( )
3. Inert gases are monoatomic. ( )
4. In solar cells, the solar energy is converted into heat energy. ( )

B **What happens when ... ?**

1. Leaving a piece of iron exposed to air.
2. Friction of the bicycle wheels to a rough surface.
3. The bones of the front limbs & fingers of monkey are not elongated.

C **Cross the odd word & write the scientific term of the others :**

1. Locust – Mosquito – Spider – Cockroach – Flies.
2. Butter – Ice – Iron – Wax.
3. $_{10}$Ne – $_{18}$Ar – $_{2}$He – $_{12}$Mg

Question 4

A **What is meant by ... ?**

1. Mechanical energy.
2. The density of water is 1 gm/cm^3.

B **Write the symbols of the following element :**

1. Aluminium. 2. Silver. 3. Mercury. 4. Calcium.

C **Two objects, object (A) its mass 8000 gm. at 6 m. height from the earth's surface, and object (B) of weight 50 N. at 10 m. height, from earth's surface, which of the two objects stores more potential energy.** (Given gravity acceleration = 10 m/sec^2)

8 Giza Governorate — Abou Elnomrous Directorate

Answer the following questions :

Question 1

A Complete the following statements :

1. In solar cell, ... energy changes into .... energy.
2. The monoatomic liquid is ...., while .... is diatomic liquid.
3. Heat transfers through solids by ...., while through liquids by ....
4. The front limbs of whale are modified into .... to helps it to ....

B Give an example for :

1. Very active metal.
2. Dicotyledon plant.
3. A device changes electric energy to heat energy.
4. A solid substance which is soft at room temperature.

C An object whose mass is 2 kg. moving at a speed 5 m/sec. Calculate its kinetic energy.

Question 2

A Write the scientific term :

1. The basic classification unit of the living organisms.
2. The sum of potential energy and kinetic energy.
3. The spaces between molecules.
4. The smallest building unit of matter which can exist freely.
5. Energy is neither created nor destroyed but it is converted from one from to another.
6. The ability of some living organisms to hide from their enemies.

B Write the electronic configuration and calculate the number of neutrons of :

1. $^{35}_{17}Cl$ 2. $^{20}_{10}Ne$ 3. $^{16}_{8}O$

C Mention one difference between :

1. The electron and the proton.
2. Insects and arachnids.



Question 3

A Choose the correct answer :

1. From animals with internal support ....
   a. octopus. b. fish. c. snail. d. jellyfish.
2. Silver is symbolized by ....
   a. Hg b. S c. Si d. Ag
3. Chemical energy can stored in ....
   a. car battery. b. stretched spring.
   c. raising a load upwards. d. car lamps.
4. .... is an example for plants that reproduce by spores.
   a. Pine b. Bean c. Vougheir d. Wheat
5. .... is a permanent source of energy.
   a. Petrol b. The Sun c. Coal d. Battery
6. The third energy level is saturated by .... electrons.
   a. 2 b. 10 c. 18 d. 8

B Give reasons for :

1. The freezer is found at the top of the fridge.
2. The shallow water birds have long and thin beaks.
3. It is easy to divide an amount of water to smaller parts.

C What is meant by ... ?

1. Mass number. 2. Hibernation.

Question 4

A Correct the underlined words :

1. The molecule of a compound consist of **similar** atoms.
2. Insectivorous plants absorb nitrogen to form **fats**.
3. Frication produces **light** energy.
4. **Kinetic** energy stored in the object due to work done on it.
5. In the simple electric cell the positive pole is made of **zinc**.
6. Liquids have a **fixed** shape.

B Mention one use or function for the following :

1. Nickel-chrome alloy.
2. Simple electric cell.

3. Palm legs in geese.
4. Long arms and fingers in monkey.

C What happens when ... ?

1. When an electron gains a quantum of energy.
2. Increasing the speed of a moving object to double its value when the mass is constant (concerning the kinetic energy).

9 Giza Governorate — El-Sadat Gov. Language Schools

Answer the following questions :

Question 1

A Complete the following :

1. The animals with external support such as .... and ....
2. Silver symbol is .... whereas sodium symbol is ....
3. In the simple electric cell the .... energy changes to .... energy.
4. The liquid element its molecule composed of one atom is .... , while the liquid element composed of two atoms is ....

B Mention the difference between :

1. Potassium and gold. (according chemical activity).
2. Bat and whale (according to the adaptation of the front limbs).

C Find the kinetic energy of a body its mass is 500 gram and moves with speed of 6 m/s.

Question 2

A Choose the correct answer :

1. In the rodent the number of incisors in the upper jaw is ....
   a. one pair. b. two pairs. c. three pairs. d. none.
2. Heat transfers from Sun to Earth by ....
   a. conduction. b. convection. c. radiation. d. no answer.
3. When the object is throw upward the .... of object decreases.
   a. mass b. heat c. potential energy d. kinetic energy
4. Spider belongs to ....
   a. insects. b. arachnids. c. myriapods. d. vertebrates.

B Compare in table between :

Car dynamo and car cassette (according to the energy used and energy produced).

C Write the name and draw the electronic configuration of the following atoms :

1. $_{20}Ca$ 2. $_{15}P$ 3. $_{18}Ar$

Question 3

A Write the scientific term of the followings :

1. The sum of potential and kinetic energy.
2. Pollution produced from the networks of cellular phone.
3. The sum of positive protons and neutral neutrons in the nucleus of atom.
4. Energy is neither created nor destroyed, but it is converted from one form to another.

B Give reasons for :

1. Freezer is found at the top of the fridge.
2. Frogs hibernate in winter.
3. The atom is electrically neutral in its ordinary state.

Question 4

A When copper piece its mass 156 gm. is put in graduated cylinder containing 100 cm^3 of water, the reading of cylinder becomes 120 cm^3. Calculate the density of copper.

B What happens when ... ?

1. The legs of camel do not end with thick flat pads.
2. Adding 100 cm^3 of ethyl alcohol to 400 cm^3 of water.

C Give an example for each of the followings :

1. An alloy used in making heating coil.
2. Insectivorous plants.
3. Solid substance has low melting point.
4. Permanent source of energy.

10 Giza Governorate — Awseem Directorate

Answer the following questions :

Question 1

A Complete the following statements :

1. The symbol of .... is (Ag), while the symbol of .... is (Hg).
2. Bird migration is considered as .... adaptation.

3. Heat transfers by .... through material media and non-material media.
4. In photosynthesis process, ... energy is changed into .... energy.
5. Electrons revolve around the .... in orbits known as ....

B What happens when ... ?

1. A compass is put near to a wire of simple electric cell.
2. Increasing the speed of moving object to double and why ?

Question 2

A Write the scientific term for each of the following sentences :

1. The sum of potential and kinetic energies.
2. The number of positive protons in the nucleus.
3. Temperature at which solid state begins to change into liquid one.
4. The simplest pure form of matter which can't be analyzed to simpler.

B What is meant by each ... ?

1. Hibernation.
2. Law of conservation of energy.

C Compare between each of the following :

1. Ammonia gas and hydrogen chloride (according to : number of elements and number of atoms).
2. Solid and gas (according to intermolecular spaces and forces).

Question 3

A Give reasons for each of the following :

1. The atom is electrically neutral.
2. The shallow water birds have long and thin beaks.
3. Wood floats on water surface, while a piece of iron sinks in it.
4. Some plants are insectivorous plants.
5. Electric wires are made up of copper.

B If the work done to move a box a distance of 5 metres equal 20 joules. Calculate the force.

C Write the chemical symbol of :

1. Iron.
2. Gold.
3. Copper.
4. Zinc.

Question 4

A Write the mathematical relationship that binds between each of the following :

1. The weight of an object and its mass.
2. The number of electrons that saturates certain energy level.
3. Density, mass and volume of a substance.

B Write the electronic configuration for the following elements, then calculate the number of protons and mention the type of the element.

1. $^{40}_{20}Ca$ 2. $^{20}_{10}Ne$ 3. $^{35}_{17}Cl$ 4. $^{4}_{2}He$

C Give one example for :

1. Liquid diatomic element.
2. Soft body organism.

11 Alexandria Governorate — Al-Safwa Integrated School

Answer the following questions :

Question 1

A Complete the following statements :

1. .... alloy is used in making jewels, while .... alloy is used in making heating coils.
2. The monoatomic liquid is .... , while the diatomic liquid is ....
3. The electric lamp changes .... energy into .... energy.
4. From teethless mammals are .... and ....
5. Heat is transferred in solids by ...., while in liquids by ....

B Give one example :

1. A very active metal.
2. Noble gas.
3. Animal with soft body.
4. Arachnids.

Question 2

A Write the scientific term :

1. The temperature at which matter begins to change from solid to liquid.
2. The simplest pure form of matter which can't be analyzed.
3. The ability to do work or make a change.
4. The basic classification unit of living organisms.
5. The ability of some living organisms to be hidden from enemies.
6. Energy is neither created nor destroyed but it is converted from one form to another.

B Give reasons for :

1. Atom is electrically neutral.
2. Heater is placed on the ground.

C Correct the underlined words :

1. Measuring unit of energy is <u>newton</u>.
2. In solar heater, the solar energy is converted into <u>kinetic</u> energy.

3. In winter frog undergoes **aestivation**.

4. The chemical symbol of potassium is **PO**.

Question 3

A Choose the correct answer :

1. The symbol of silver is ....
   a. Ar b. Ag c. Au d. Al
2. .... is an example of plant that reproduce by spores.
   a. Adiantum b. Bean c. Voughier d. (a) and (c)
3. The measuring unit of density is ....
   a. cm/gm. b. gm/cm^3. c. kg/cm. d. gm/cm.
4. An object its mass is 2 kg. and moving at speed 4m/s, so its kinetic energy = ...
   a. 16 joule. b. 64 joule. c. 32 joule. d. 2 joule.
5. Chemical energy can be stored in ....
   a. car battery. b. stretched spring. c. lamp. d. waterfalls.

B Compare between each of the following :

1. Rodents and lagomorphs (according number of teeth in each jaw).
2. Solids and gases (according to attraction force).

Question 4

A Put (✓) or (✗) and correct the wrong ones :

1. The first energy level (K) is saturated with 8 electrons. ( )
2. Mechanical energy is converted into heat energy by friction. ( )
3. Sun is the permanent source of energy. ( )
4. Bean plant is from monocotyledon. ( )

B Write the electronic configuration of each of the following atoms :

1. $^{24}_{12}Mg$ 2. $^{23}_{11}Na$ 3. $^{20}_{10}Ne$ 4. $^{16}_{8}O$

Then find the number of neutrons

C On determining iron density by using a piece of iron of mass 78 gm. the piece is immersed in 100 cm^3 of water the water increases up to 110 cm^3. Calculate iron density.

12 Alexandria Governorate — El Montaza Zone Directorate

Answer the following questions :

Question 1

A Complete the following statements :

1. Density is the .... of unit volume of the substance and its unit is ....
2. The liquid element its molecule is composed of one atom is ...., while that composed of two atoms are ....
3. .... and .... are teethless mammals.
4. Heat is carried from the electric heater to our body by .... and ....

B Write the symbols of the following elements :

1. Lithium. 2. Silver. 3. Chlorine.

C A stone of 5 kg. falls from 8 m, What is its potential energy ? (Gravity acceleration = 10 m/s^2)

1. At the start of falling. 2. At the height of 2 m.
3. On reaching ground.

Question 2

A Write the scientific term :

1. Imaginary places in which electrons can move according to their energies.
2. The way by which the heat is transferred throw gasses and liquids.
3. An example of animal with external support.
4. The sum of potential energy and kinetic energy.
5. The basic classification unit of living organisms.

B Mention one use for the following :

1. Simple electric cell. 2. Nickel-chrome alloy. 3. The palm legs in geese.

C What happens when ... ?

1. Three atoms of hydrogen combine with one atom of nitrogen.
2. An object is thrown upwards.
3. Increasing the mass of a body to double (According to its density).

Question 3

A Correct the underlined words :

1. The solar cell changes the solar energy into <u>heat</u> energy.

2. The simple electric cell consists of **a sugary solutions** dipped in it two different metals.
3. Vougheir is the fern plant that reproduces by formation of **seeds**.
4. Heat is transferred from the Sun to the Earth by **convection**.
5. Banana tree carries **small-sized** leaves.

B Cross out the unsuitable word :

1. Locust – Mosquito – Cockroach – Spider.
2. Beans – Pea – Pine – Corn.
3. Petroleum -- wood – Cork – Iron.

C Give reasons for :

1. The intercourse (mate) between dog and cat impossible.
2. The motion of the children's swing is like that of the pendulum.
3. The atom is electrically neutral.

Question 4

A Choose the correct answer :

1. An object of mass 2 kg. is moving at a speed of 4 m/s. has a kinetic energy .... joules.
   a. 16 b. 64 c. 32
2. In solar heater, solar energy is converted into .... energy.
   a. light b. electric c. heat
3. .... is from the rodents that undergo aestivation.
   a. Rat b. Jerboa c. Desert snail
4. The colour property is a distinguishing factor between ....
   a. Flour–sugar. b. silver–gold. c. oxygen–helium.
5. The third energy level is saturated by .... electrons.
   a. 2 b. 18 c. 8
6. A substance is solid and can't be soften by heating ....
   a. copper. b. sulphur. c. aluminum.

B Write the electronic configuration :

1. $^{23}_{11}Na$ 2. $^{20}_{10}Ne$

Then determine each of the following :

1. Atomic number.
2. Mass number.
3. Number of electrons.
4. Number of Neutrons.
5. Number of energy levels.
6. Chemical activity.



13 Alexandria Governorate — East Zone Directorate

Answer the following questions :

Question 1

A Complete the following statements :

1. The liquid element which its molecule is composed of one atom is .... , while that is composed of two atoms is ....
2. Some solutions are good conductors of electricity as .... and .... , while others are bad conductors of electricity as ....
3. Heat is transferred through gases by ...., while transferred through solids by ....
4. From plants that have large leaves .... and from that have small leaves ....
5. Secretion of sweat in humans is a .... adaptation.

B Show by drawing the electronic configuration of the following elements :

1. $_{16}S$
2. $_{6}C$

C What is meant by ... ?

1. Boiling point.
2. Heat energy.

Question 2

A Write the scientific term :

1. The behavior that desert animals do to avoid the high temperature in summer.
2. The result of combination between two or more atoms of different elements with constant weight ratios.
3. The gases that do not take part in the chemical reaction.
4. The stored energy in an object due to the work done on it.
5. Imaginary places around the nucleus in which the electron move according to their energy.
6. A group of animals similar in their shape and can get intermated together to produce fertile individuals.

B Give reasons for each of the following :

1. Technology has negative effects in the environment.
2. The kinetic energy of a moving object increases by the increase of its mass.
3. The rule ($2n^2$) is not applied on the energy levels greater than four.

C **Write the symbols of the following elements :**

1. Aluminium. 2. Phosphorus.

Question 3

A **Put (✓) or (✗) and correct the wrong ones :**

1. In solar cells, the solar energy is converted into heat energy. ( )
2. The intermolecular spaces among molecules of solids very large. ( )
3. Scorpion has three pairs of jointed legs. ( )
4. Heating coils are made up of nickel-chrome alloy. ( )
5. Temperature is directly proportional to the kinetic energy of particles. ( )

B **Mention one importance of :**

1. The front teeth of hedgehog.
2. The thick flat pad at the end of camel's limb.

C **An object has a kinetic energy 64 joule and is moving at a velocity 4 m/s. Find the object mass.**

Question 4

A **Choose the correct answer :**

1. Chemical energy can be stored in ....
   a. car battery. b. raising a load up wards.
   c. stretched spring. d. car lamps.
2. The chemical activity of the element depends on the number of ....
   a. neutrons. b. protons.
   c. electrons in the outer level. d. levels filled with electrons.
3. An element has 2 electrons in the (L) level, so its atomic number is ....
   a. 2 b. 4 c. 6 d. 8
4. All of the following are active elements except ....
   a. $_{1}H$ b. $_{6}C$ c. $_{7}N$ d. $_{18}Ar$
5. Cooking pans are made up of ....
   a. iron only. b. aluminium only.
   c. stainless steel only. d. (b) and (c)
6. The substances that float on water surface is ....
   a. iron. b. cork. c. aluminium. d. copper.

B What happens when ... ?

1. Using water to extinguish petrol fires.
2. Dipping two different metals connected by copper wire in an acidic solution.

C Give one example for each of the following :

1. An animal with external supported body.
2. A teethless animal.
3. A plant that reproduces by spores.
4. A mammal which its front limbs are modified into wings.

14 Kalyobia Governorate — Banha Directorate

Answer the following questions :

Question 1

A Complete the following sentences :

1. Hawks have .... beaks to tear the prey, whereas ducks have .... beaks to filter food from water.
2. Electrons are particles with .... charge, while protons are particles with .... charge.

B Show by words, what are these symbols mean ?

1. Al 2. O 3. H 4. Fe.

C Compare between :

Elements and compounds in only one point (one example on each one).

D Transfer the following table to your answer paper and fill it :

Element symbol	Atomic number	Mass number	Number of protons	Number of electrons	Number of neutrons
$^{14}_{7}N$	....	....	....	....	....
$^{12}_{6}C$	....	....	....	....	....

Question 2

A Put (✓) or (✗) and correct the wrong ones :

1. Intermolecular spaces are tiny in solids. ( )
2. Insectivorous plants can absorb nitrogenous substances from insects. ( )
3. From substances that float on the surface of water is copper. ( )

B **Find the weight of an object its mass 50 kg, knowing that the Earth's gravitational acceleration is 9.8 m/sec^2.**

C **Choose the odd word out and say why do you choose it ?**

1. Height – Weight – Mass – Potential energy.
2. Ant – Bee – Spider – Cockroach – Locust.
3. Drosera – Dieonea – Cactus – Halophila.
4. Bean – Pea – Maize – Pine – Wheat.

D **Correct the underlined word :**

1. Maize is from **dicotyledon** plants.
2. Octopus is from **supported body** animals.
3. A horse hoof is an example on **behavioral** adaptation.

Question 3

A **On determining iron density using a piece of iron of mass 78 gm. The piece is immerged in 100 cm^3. of water, the water increases up to 110 cm^3. Calculate iron density.**

B **Choose the right answer :**

1. The number of energy levels in the heaviest atoms is ....
   a. 7 b. 8 c. 32 d. 18
2. From inert gases ....
   a. nitrogen. b. helium. c. oxygen. d. bromine
3. Heat transfers from Sun to Earth by ....
   a. convection. b. radiation.
   c. conduction. d. conduction and convection.
4. In car engine, ... energy of the fuel is changed into heat and mechanical energy.
   a. chemical b. electric c. light d. solar

C **Define :** 1. Matter. 2. Kinetic energy.

D **Illustrate :** The electronic configuration for 1. $^{23}_{11}Na$ 2. $^{40}_{20}Ca$

E **Draw a diagram to show the simple electric cell.**

Question 4

A **A ball was launched upwards and vertically at a speed 3 m/sec. up to a height 4m. Calculate the mechanical energy (work done) of the ball if its weight is 5 newton and has a mass of 0.5 Kg.**

B Write the scientific term :

1. They are metals which find great difficulty in reacting with oxygen.
2. The ability to exert (do) work or make a change.

C Give reasons for :

1. Water is not used to put out petroleum fire.
2. Freezer of the fridge is found at the top.

D What happens when .... ?

1. No aestivation occurs to jerboa.
2. If the front limbs of the bat are not modified into wings.

E Match :

(A)	(B)
1. Migration of quail bird	a. Scorpion.
2. Soft bodies	b. Mosquitoes.
3. Insects	c. Behavioral adaptation.
4. Myriapods	d. Armadillo.
	e. Scolopendra.
	f. Earthworm.

15 El-Menofia Governorate — Shebin Elkom Directorate

Answer the following questions :

Question 1

A Complete the following sentences :

1. A piece of metal its mass is 25 g. and its volume is 10 cm^3, when it is placed in water it will .... (water density 1g/cm^3.)
2. Kinetic energy increases by increasing .... and .... of the object.
3. The density is directly proportional to .... and inversely proportional to ....
4. Drosera and Dieonea are examples for ....
5. Some substances are solids which cannot be soften if heated such as .... and ....
6. The networks of wireless transmitters of cellular phones cause .... pollution but car exhaust causes .... pollution.

B Write the electronic configuration of the following atoms and calculate the number of neutrons in each atom ? ($^{24}_{12}Mg$ – $^{35}_{17}Cl$)

Question 2

A Write the scientific term for each of the following sentences :

1. It is the temperature at which a substance begins to change from a liquid state into a gaseous state.
2. It is a form of energy which transfers from a higher temperature object to a lower temperature object.
3. Animals have one pair of incisors in each jaw.
4. It is the amount of energy lost or gained by an electron when it transfers from one energy level to another.

B What happen when & Why ... ?

1. Dipping two different metals connected by a wire in an sugary solution.
2. Removal the front teeth of hedgehog.

C Compare between :

Sodium and copper according to (React with oxygen and Chemical activity).

Question 3

A Put (✓) or (✗) :

1. Molecules of the same substance are different from each other. ( )
2. All mammals walk on four limbs. ( )
3. Work done = Force × Displacement. ( )
4. Activity of birds during the daylight and bats at night are examples of functional adaptation. ( )
5. The electrons are distributed to fill the "K" level before filling the "L" level. ( )
6. Intermolecular space between molecules of the matter is directly proportional with its intermolecular forces. ( )

B Give reasons for :

1. Equal masses of different substances have different volumes.
2. It is easy to divide an amount of water into smaller parts.
3. The freezer is found at the top of fridge.
4. Spider is not from insects.

Question 4

A Give one example showing each of the following :

1. Molecules of gaseous elements are composed of one atom.
2. A device converts electric energy into mechanical energy.
3. Hibernation in amphibians.
4. Micro-organisms.

B A stone of 5 kg. mass falls from 8 m. height, find its potential energy and its kinetic energy at the start of falling. (gravity acceleration = 10 m/s^2.)

C Explain each of the following :

1. The moving pendulum keeps its mechanical energy.
2. The way of reproduction different in vougheir plant from wheat plant.
3. $_{10}$Ne atom is more stable than $_{17}$Cl atom.

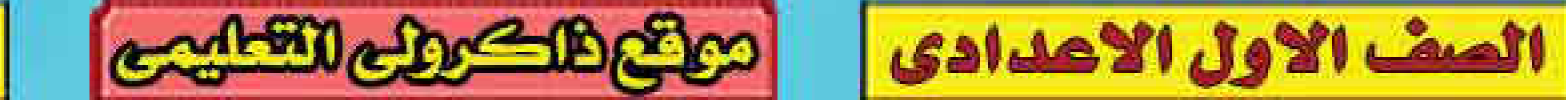
16 Gharbia Governorate — El Salam Private Language School Tanta

Answer the following questions :

Question 1

A Choose the correct answer :

1. Equal masses of different substances have .... volumes.
   a. different b. constant c. equal
2. When a substance sinks in water, that means its density is .... the density of water.
   a. equal to b. less than c. more than
3. The .... matter doesn't take the shape of the container.
   a. solid b. liquid c. gaseous
4. The molecule of oxygen is composed of .... atom(s).
   a. one b. two c. three
5. The particles which revolve around the nucleus of an atom of element are ....
   a. neutrons. b. protons. c. electrons.
6. .... are from the animals which don't have a body support.
   a. Reptiles b. Snails c. Jellyfish

B **Mention the difference between each of the following :**

1. Insects and arachnids.
2. Active metals and inactive metals.

C **Give reasons for :**

1. Car engine is important to the car.
2. The heater is placed on the ground.

Question 2

A **Put (✓) or (✗) and correct the wrong ones :**

1. Argon atom ($^{40}_{18}$Ar) has four energy levels. ( )
2. The melting point of wax is equal to the melting point of table salt. ( )
3. The kinetic energy of a static object equals zero. ( )
4. In the electric cell, the electric energy is converted into chemical energy. ( )
5. Insectivorous plants can't absorb the nitrogenous substances from the soil needed to make fat. ( )
6. The energy level "K" has the highest energy. ( )

B **Write the electronic configuration of the following atoms :**

1. $^{16}_{8}$O
2. $^{35}_{17}$Cl

C **What is meant by ... ?**

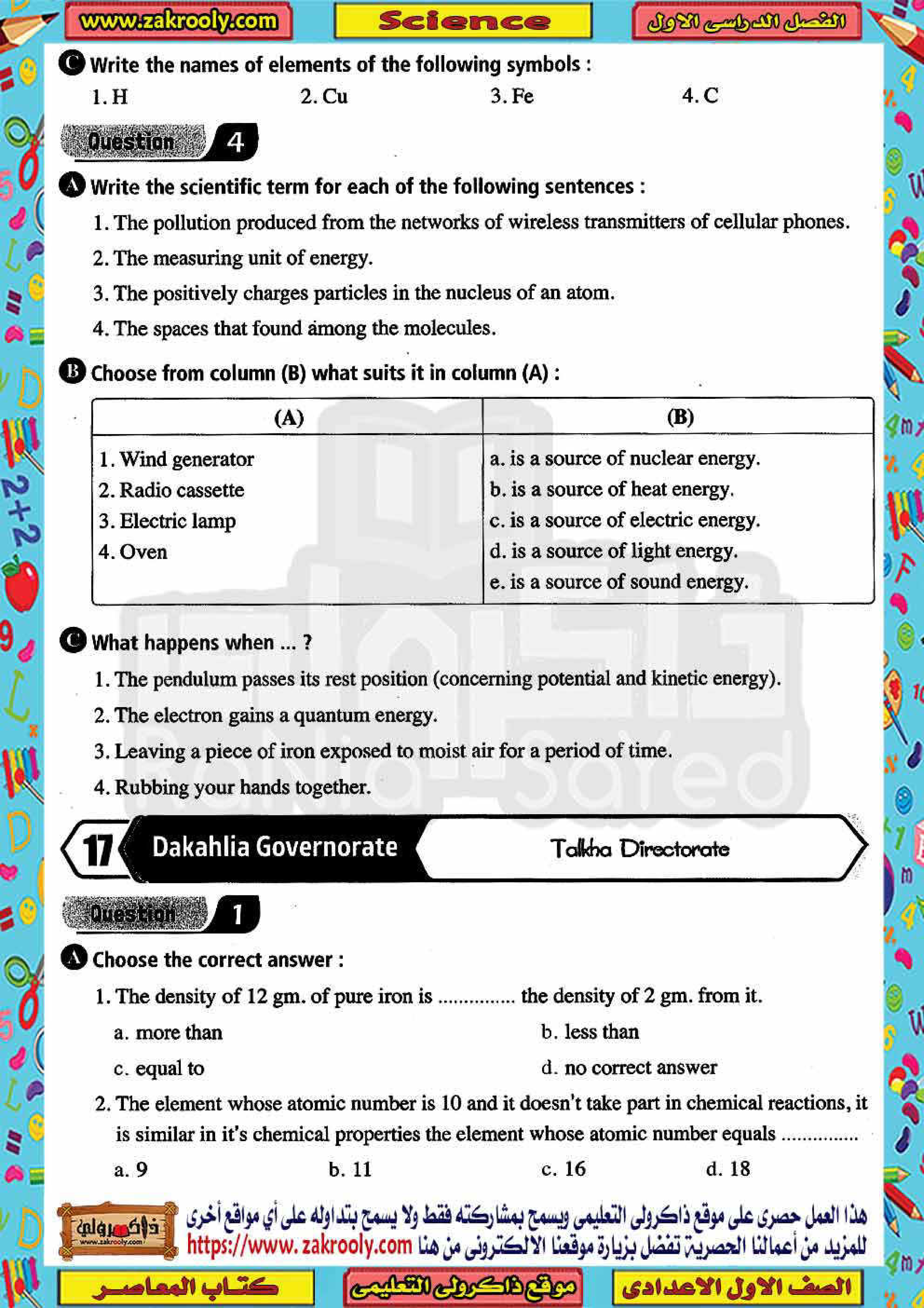
1. Micro-organisms.
2. Adaptation.
3. Transfer of heat by radiation.

Question 3

A **Complete the following statements :**

1. The density is the .... of unit volume of a substance and its measuring unit is ....
2. An alloy of .... is used in making jewels, while an alloy of .... is used in making coils.
3. The smallest part of the element that can take part in a chemical reaction is known as ....
4. The symbol of sodium atom is ...., while that of sulphur atom is ....
5. .... is the basic unit of classification in living organisms.

B **A ball was lunched upwards and vertically at a speed 3 m/s. up to a height 4m.**
Calculate the mechanical energy of the ball if its weight is 5 newton and has a mass 0.5 Kg.



C Write the names of elements of the following symbols :

1. H 2. Cu 3. Fe 4. C

Question 4

A Write the scientific term for each of the following sentences :

1. The pollution produced from the networks of wireless transmitters of cellular phones.
2. The measuring unit of energy.
3. The positively charges particles in the nucleus of an atom.
4. The spaces that found among the molecules.

B Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Wind generator	a. is a source of nuclear energy.
2. Radio cassette	b. is a source of heat energy.
3. Electric lamp	c. is a source of electric energy.
4. Oven	d. is a source of light energy.
	e. is a source of sound energy.

C What happens when ... ?

1. The pendulum passes its rest position (concerning potential and kinetic energy).
2. The electron gains a quantum energy.
3. Leaving a piece of iron exposed to moist air for a period of time.
4. Rubbing your hands together.

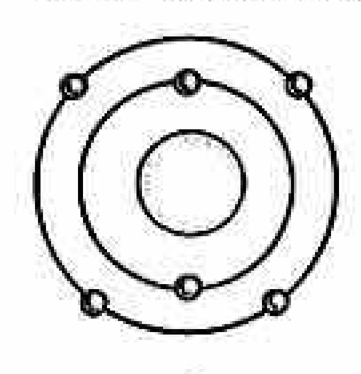
17 Dakahlia Governorate — Talkha Directorate

Question 1

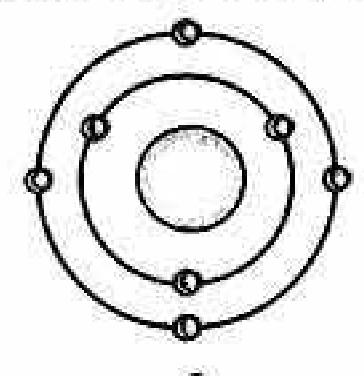
A Choose the correct answer :

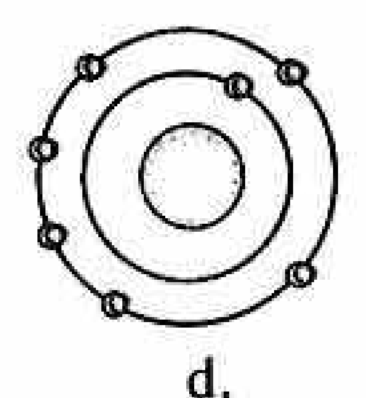
1. The density of 12 gm. of pure iron is .... the density of 2 gm. from it.
   a. more than b. less than
   c. equal to d. no correct answer
2. The element whose atomic number is 10 and it doesn't take part in chemical reactions, it is similar in it's chemical properties the element whose atomic number equals ....
   a. 9 b. 11 c. 16 d. 18

3. Which of the following atoms represents an excited atom ... ?


a.

b.


c.


d.

4. Amoeba, euglena and paramecium differ from each other in the ....

a. number of teeth.
b. number of legs.
c. kind of support.
d. way of movement.

5. .... insect exactly looks like the plant branches.

a. Stick
b. Beetle
c. Leaf
d. Locust

B Your classmate has seen a bird, he doesn't knows this bird's name but he managed to describe it as a bird with a sharp beak and the legs end in fingers with strong claws. According to your classmate story, answer the following questions :

1. What is the type of adaptation in both the beak and leg of this bird ?
2. How many fingers are in each leg ?
3. What type of food does this bird feed on ?

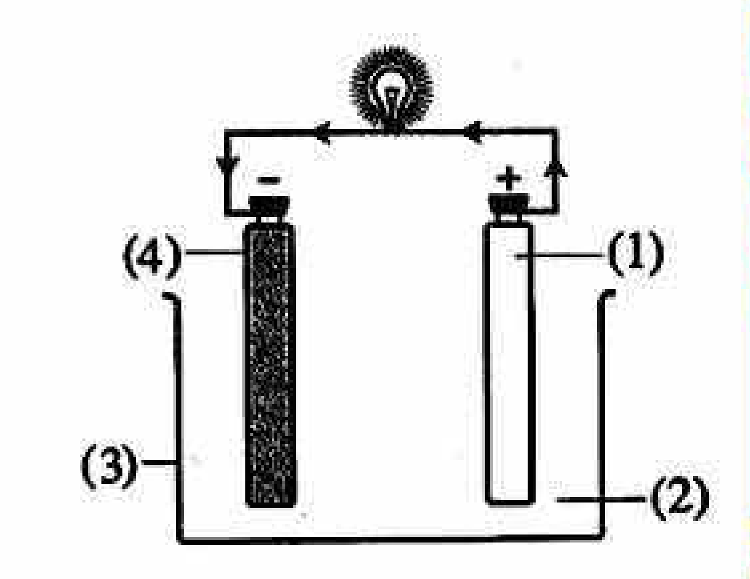
Question 2

A Put (✓) or (✗) for each of the following :

1. The fuel inside the car is similar to the food inside the body of a living organism. ( )
2. Heat is transferred in solid materials by radiation. ( )
3. When air is cooled, density decreases, so it falls down. ( )
4. No change in the potential energy when the object moves horizontally. ( )
5. Gymnosperms are classified into monocotyledon and dicotyledon plants. ( )
6. Smell property is a distinguishing factor between perfume and ammonia. ( )

B From the opposite figure answer the following questions :

1. Mention the name of the opposite device.
2. Label the fig.
3. Mention the idea of its operation.



Question 3

A Give reasons for each of the following :

1. Disappearance of a little amount of table salt when it is put in a beaker containing water for a period of time.
2. The atom is electrically neutral.
3. The kinetic energy will increase four times as the speed of the moving object is doubled.
4. Car exhaust is considered from the negative effects of technological applications.

B Answer the following :

1. The teacher advised the pupils to lie on the ground when the smoke emitted from any fire. What is your interpretation of the teacher's advise in the light of your understanding of the concept of transferring the heat by convection ?
2. The opposite figure represents a part of a plant.
   a. What is the difference between this plant and bean plant ?
   b. What is the similarity between this plant and cycas plant ?
   c. Mention another example in the same classification of this plant.

Question 

A Write the scientific term for each of the following sentences :

1. The modification in the behavior of a living organism at specific times of the day or year.
2. The branch of biology that searches for the similarities and differences among living organisms.
3. A group of animals that have one pair of incisors in each jaw.
4. Energy is neither created nor destroyed, but it is converted from one form to another.

B Write the symbol of the following elements :

1. Potassium. 2. Aluminium. 3. Chlorine. 4. Nitrogen.

C A stone, whose mass is 5 kg. is thrown from a height of 8 m. find its potential energy and its kinetic energy :

1. at the beginning of fall.
2. After reaching at a height of 2 m.
3. When the stone reaches the Earth.

(Knowing that the acceleration due to gravity = 10 m/sec^2.).

18 Port Said Governorate — Port Said Integrated Language Schools

Answer the following questions :

Question 1

A Complete the following statements :

1. The front limbs of dolphins are modified into .... to take the role of ....
2. .... and .... are from micro-organisms.
3. Heat is transferred through liquids by ...., while through space by ....
4. The .... belongs to insects, whereas the .... belongs to arachnids.
5. An alloy of .... is used in making jewels, while an alloy of .... is used in making heating coils.
6. In the dynamo, ... energy changes into .... energy.

B Draw the electronic configuration for each of the following elements :

1. ${}^{40}_{18}Ar$ 2. ${}^{7}_{3}Li$ 3. ${}^{24}_{12}Mg$ 4. ${}^{19}_{9}F$

C Give reasons for each of the following :

1. Some plants pounce and predate insects.
2. You feel hot when you touch a hot metallic spoon.
3. Atom is electically neutral.
4. Inert gases can't share in chemical reactions.

Question 2

A Write the word(s) that represent(s) each of the following (scientific term) :

1. The temperature at which matter starts to change from solid to liquid.
2. Ability to do work or to make a change.
3. The branch of biology that searches for the similarities and differences among living organisms.
4. The sum of potential and kinetic energies.
5. The ability of some living organisms to be hidden from enemies or to capture the preys.

B In an experiments to determine water density, the following results are recorded :

1. Mass of an empty glass beaker = 56 g.
2. Mass of the beaker containing water = 156 g.
3. Volume of the water measured by a graduated cylinder = 100 cm^3.

Calculate the water density.

C Write the symbol for each of the following :

1. Chlorine. 2. Aluminium 3. Zinc 4. Silver

Question 3

A Choose from column (B), what suits column (A) :

(A)	(B)
1. Banana plant	a. is from gymnosperms.
2. Wheat plant	b. has small sized leaves.
3. Pine plants	c. is from monocotyledon.
4. Molukhiyah plant	d. is from dicotyledon.
	e. has large sized leaves.

B Compare between each of the following :

1. Solar cell and solar heater (Concerning the energy transformation).
2. Elements and compounds (Concerning the definition and one example for each).

C Correct the underlined words :

1. The nucleus of the atom is **negatively** charged.
2. **Hydrogen** is from inert gases.
3. **Octopus** is from myriapods.
4. **Bromine** is the only liquid metal that its molecule consists of one atom.

Question 4

A Choose the correct answer :

1. .... is from teethless mammals.
   a. Lion b. Cow c. Lizard d. Sloth
2. .... is a permanent source of energy.
   a. Wind b. Fuel c. Food d. The Sun
3. Electric energy is converted into sound energy in ....
   a. car battery. b. car lamps. c. radio cassette. d. pendulum.
4. Taste property is a distinguishing factor between ....
   a. copper and iron. b. vinegar and perfume. c. salt and sugar. d. gold and silver.
5. An object whose mass 2 kg. is moving at speed of 4 m/s. its kinetic energy .... joule.
   a. 16 b. 64 c. 32 d. 128

B Look at the following figure, then answer the following questions :

1. The position(s) at which potential energy is the maximum value.
2. The position(s) at which kinetic energy is the maximum value.

Knowing that the weight of the ball = 20 N.

Calculate the potential energy at position (1).

1

Height = 50m.

2

C What is meant by ... ?

1. The law of conservation of energy.
2. Boiling point.
3. Quantum.

19 Damietta Governorate — Damietta Education Directorate

Answer the following questions :

Question 1

A Complete the following statements :

1. The simple electric cell converts .... energy into .... energy, while in solar cell .... energy changes into .... energy.
2. An alloy of .... is used in making jewels, while an alloy of .... is used in making heaters coils.
3. The cockroach belongs to .... , whereas the scorpion belongs to .... although both of them are arthropods.
4. Ammonia molecule consists of .... atoms and .... atom.
5. Heat is transferred through air by .... and ....
6. The monoatomic liquid is .... , while .... is diatomic liquid.
7. Some solutions are good conductors of electricity as .... solution, while some solutions don't conduct electricity as .... solution.

B Write the electronic configuration of following elements :

1. ${}_{17}C$
2. ${}_{13}Al$
3. ${}_{10}Ne$

Detect the inactive atom during chemical reactions (Give reason).

C When a piece of iron its mass 156 gm. is put in a graduated cylinder containing 100 cm^3 of water the reading becomes 120 cm^3. Calculate the density of iron.



Question 2

A Write the scientific term for the following :

1. The number of negative electrons in the energy levels around the nucleus of the atom.
2. The limited amount of energy needed or loss to transfer an electron from an energy level to another.
3. The ability of some living organisms to be hidden from their enemies.
4. The process by which some animals hide in burrows to overcome low temperature.
5. The temperature at which a matter begin to change from the liquid state to gaseous state.
6. It is a basic classification unit for living organism.

B Give one difference between each of the following :

1. Bean plant and maize plant.
2. Neutron and proton.
3. Fish and snail.
4. Intermolecular forces in solids and in gases.

C Write the symbols of the following elements :

1. Calcium.
2. Silver.
3. Zinc.
4. Potassium.

Question 3

A Give reasons for :

1. The atom is electrically neutral.
2. Drosera plant pounces insects.
3. It is easy to divide an amount of water into small droplets.
4. Some birds have long thin beaks and long thin legs.

B What is meant by ... ?

1. Adaptation.
2. The excited atom.

C What happens when ... ?

1. The front teeth of hedgehog are not extending outwards.
2. Doubling the height of an object (concerning its potential energy).
3. Using water to extinguish petrol fires.

Question 4

A Choose the correct answer :

1. An example for plants that reproduce by spores is ....
   a. adiantum. b. pea. c. bean. d. wheat.
2. From the animals which don't have a body support is ....
   a. snail. b. jellyfish.
   c. fish. d. cartilaginous fish.
3. Heat is transferred by convection through ....
   a. liquids only. b. gases only. c. solid only. d. liquids and gases.
4. When the atomic number of element equals its mass number, this means that there is no ....
   a. electrons. b. protons. c. neutrons. d. nucleus.
5. The third energy level in the atom contains .... electrons.
   a. 2 b. 18 c. 8 d. 32

B Mention the energy transformation in each of the following :

1. Electric heater. 2. Solar oven. 3. Electric bell.

C Correct the underlined words :

1. **Kinetic** energy is stored in the object due to a work done on it.
2. In rodents the incisors number in the lower jaw is **three pairs**.
3. Some animals undergo **hibernation** to overcome the high temperature.
4. Measuring unit of weight is **joule**.
5. **Gold** is from very active metals.

20 Fayoum Governorate — Science Supervision

Answer the following questions :

Question 1

A Complete the following statements :

1. Hawks have .... beaks to tear the prey, whereas ducks have .... beaks to filter food from water.
2. When car lamps and radio cassette are on, there is a change inside the car battery from .... energy into .... energy.
3. Heat is transferred through gases by .... and ....

4. Holders of light bulbs in streets are painted from time to time in order to protect it from ....
5. The hydrogen molecule is consisted of .... atoms, while the argon molecule (inert gas) is consisted of .... atom.
6. If the speed of an object motion increases into the double, its kinetic energy increases into ....
7. The cockroach belongs to ...., whereas the scorpion belongs to ....

B Define :

1. Atom.
2. Species.

Question 2

A Correct the underlined words in the following statements :

1. **Electric energy** = Potential energy + Kinetic energy.
2. **Wind** is a permanent source of energy.
3. **Ammonia** consists of one oxygen atom and two hydrogen atom.
4. **Lagomorphs** have one pair of incisors in each jaw.
5. **Mass number** is known as the number of protons existed in an atom nucleus of an element.
6. An atom third level is saturated with **8** electrons.

B Show one difference between each of the following :

1. The element and compound.
2. Beans and wheat.

C Write the symbols of the following elements :

1. Potassium.
2. Gold.
3. Magnesium.
4. Aluminium.

Question 3

A Write the scientific term for each of the following statements :

1. A modification in a living organism or its body structure or even the biological function of its organs to become more adapted to the environmental conditions where it lives in.
2. The temperature at which matter changes from a solid phase into a liquid one.
3. Energy is neither created nor destroyed but can be transformed into another form.
4. A form of energy which transfers from higher temperature to a lower one.
5. The ability to do work.
6. The simplest pure form of a matter which can't be analyzed simpler.

B **Give reasons for :**

1. The atom is electrically neutral.
2. The bike tyre gets hot once you press the brakes.
3. Forelimbs of whale are modified into paddles.

C **On finding a liquid density through an experiment, the following results were recorded : Mass of an empty glass beaker 100 g. Mass of the beaker containing liquid 150 g. Volume of the liquid measured by a graduated cylinder 100 cm³. Calculate the liquid density.**

Question 4

A **Choose the correct answer to complete the following statements :**

1. An object of 10 N. weight is placed at 5 m. height, it has a potential energy ....
   a. 50 joule. b. 150 joule. c. 100 joule. c. 200 joule.
2. The handles of cooking pots are made of ....
   a. copper. b. aluminium. c. wood. d. iron.
3. The taste property is a distinguishing factor between ....
   a. sugar and table salt. b. wood and plastic. c. silver and gold. d. coal and iron.
4. The role of technological application is represented in ....
   a. using energy resources and converting energy from form to another.
   b. creating energy from nothing.
   c. storing energy as its form is.
   d. illustrating energy forms.
5. Solids have .... intermolecular force.
   a. strong b. weak
   c. medium d. no correct answer
6. .... is an example for plants that reproduce by spores.
   a. Pine b. Beans c. Vougheir d. Wheat

B **What happens when ... ?**

1. Predator plants can't capture insects for a long period of time.
2. A liquid substance is heated.

C **Write down the electron configuration of the following atoms. Which active and which inactive ?**

1. $^{20}_{10}Ne$ 2. $^{23}_{11}Na$

21 El-Minia Governorate — New Minia Governmental Language School

Answer the following questions :

Question 1

A Choose the correct answer :

1. .... belongs to the animals with no body support.
   a. Octopus b. Mussel c. Hedgehog d. Snake
2. Dynamo converts mechanical energy into .... energy.
   a. electrical b. nuclear c. solar d. chemical
3. An object of mass 2 kg is moving at speed of 4 m/s. has kinetic energy of .... J.
   a. 16 b. 64 c. 32 d. 4
4. .... is a permanent source of energy.
   a. Wind b. Coal c. The Sun d. Water

B Write the chemical symbol of :

1. Iron. 2. Silver. 3. Sodium. 4. Calcium.

C Give reasons for :

1. The atom is electrically neutral in its ordinary state.
2. The heater is placed on the ground.
3. Camel limbs end in a thick flat pad.

Question 2

A Complete the following statements :

1. Heat is transferred through milk by ....
2. .... and .... are from plants that reproduce by spores.
3. Attraction force among the molecules of mercury is ....
4. The front limbs of whale are modified into .... for ....
5. One of the harmful effects of mobile networks is .... pollution.

B Give one difference between each of the following :

1. Bean plant and maize plant.
2. Ammonia molecule and nitrogen molecule.

C An object of density 0.5 gm/cm^3 and volume 10 cm^3 Find its mass ? And if you know the density of water is 1 gm/cm^3 Does this object sink in water ? And why ?

Question 3

A Write the scientific term :

1. The heat state of an object on which the transfer of heat from or to the object depends.
2. The temperature at which the matter begins to change from the solid state to the liquid state.
3. Energy is neither created nor destroyed but it can be transformed into another form.
4. The ability of some body organs and tissues to do a certain function.

B What happens when ... ?

1. The beaks of ducks are narrow and not indented.
2. The electron gains a quantum of energy.
3. Using of water in putting out petrol fires.
4. The height of an object is doubled (according to potential energy).

C Mention one example of each of the following :

1. An insectivorous plant. 2. Camouflage.

Question 4

A Choose the odd word out then mention the relation between the rest :

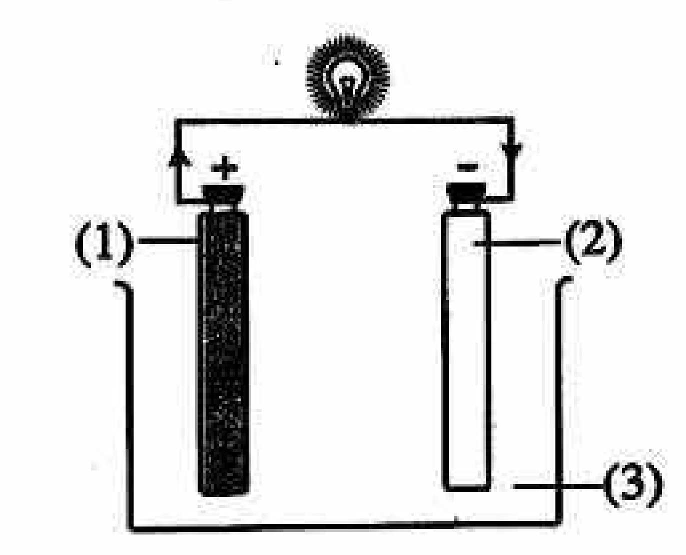
1. $_{7}N$ - $_{10}Ne$ - $_{9}F$ - $_{11}Na$.
2. Mosquito – Spider – Cockroach – Ant.
3. Iron – Copper – Aluminium – Wood.
4. Amoeba – Euglena – Clover – Paramecium.

B Write the electronic configuration of the following atoms :

1. $^{23}_{11}Na$ 2. $^{40}_{20}Ca$

C Look at the opposite figure, then answer :

1. Mention the name of the opposite.
2. Label the figure.
3. This device changes .... energy into .... energy.



22 Assiut Governorate — Assiut Directorate

Answer the following questions :

Question 1

A Complete the following statements :

1. The density is the .... of unit volume of a substance and its measuring unit is ....
2. Hydrogen molecule is composed of .... atoms, while argon molecule is composed of .... atom.
3. .... is from the plants that reproduce by formation of spores, while .... is from the plants that reproduce by formation of seeds inside cones.
4. Mechanical energy = ... + ...
5. The whale's front limbs are modified into .... to take the role of ....

B What is meant by ... ?

1. Boiling point.
2. The potential energy of an object = 20 joules.

C Write the symbols of the following elements :

1. Sodium. 2. Aluminium.

Question 2

A Give reasons for :

1. A piece of ice changes into water after a period of time when it is left in air.
2. Some plants pounce and digest insects.
3. The freezer is found at the top of the fridge.
4. The atom is electrically neutral.

B Write the electronic configuration of the following elements, then :

1. $^{7}_{3}Li$ 2. $^{24}_{12}Mg$

- Find the number of electrons in the outermost energy leve' in each atom.
- Calculate the number of neutrons in each atom.

C What is the mass of a body, whose kinetic energy is 64 joules and its speed is 4 m/sec ?

Question 3

A Choose the correct answer :

1. The property of electric conduction is distinguishing factor between ....
   a. iron and copper. b. wood and plastic.
   c. iron and wood. d. no correct answer.
2. An object of 20 N. weight and it is placed at a height of 5 m. , so its potential energy is .... joules.
   a. 50 b. 150 c. 100 d. 200
3. If you sit down beside an electric heater, heat is transferred to you by ....
   a. convection. b. radiation.
   c. conduction. d. convection & radiation.
4. Scorpion belongs to ....
   a. insects. b. arachnids. c. myriapods. d. mammals.
5. The sum of the number of protons and neutrons in the nucleus of the atom is known as ....
   a. atomic number. b. valency. c. mass number. d. density.

B Give an example of each of the following :

1. Hibernation in amphibia.
2. Camouflage in insects.

C Mention the difference between each of the following :

1. Rabbit & squirrel. 2. Bean & wheat.

Question 4

A Write the scientific term :

1. A group of animals that have three pairs of jointed legs.
2. A form of energy which is transferred from the object of higher temperature to that of lower temperature.
3. A set similar animals in their shape and can get intermated together to produce fertile individuals.
4. The fundamental building unit of matter that can take part in the chemical reaction.

B Write the odd out and write the scientific term of others :

1. Wheat – Pea – Corn – Bean – Pine.
2. Lion – Tiger – Dog – Wolf – Armadillo.

C State the energy transformation in each of the following :

1. Dynamo. 2. Electric lamp. 3. Motor. 4. Electric bell.



23 Sohag Governorate — El-Balina Directorate

Answer the following questions :

Question 1

A Complete the following statements :

1. An alloy of .... is used in making jewels, while an alloy of .... is used in making heating coils.
2. .... and .... are teethless mammals.
3. When a body raised up, the potential energy ...., while the kinetic energy ....
4. .... and .... are used in classifying plants.

B Write the chemical symbols of :

1. Sodium. 2. Calcium. 3. Potassium. 4. Chlorine.

C Give an example for :

1. Camouflage in insects.
2. Aestivation in rodents.
3. A device changes kinetic energy into electric energy.
4. A permanent source of energy.

Question 2

A Write the scientific term :

1. Energy gained or lost to transfer an electron from one energy level to another.
2. Energy is neither created nor destroyed but it can be transformed into another form.
3. The basic unit of classification in living organisms.
4. Number of positive protons in nucleus of the atom.
5. Energy stored in the object due to the work done on the object.
6. Plants can't be distinguished into roots, stems and leaves.

B Give reasons for :

1. The heater is put at the bottom of the room.
2. Workmen melt the solid metals.
3. Atom is electrically neutral.
4. Some animals hibernate in winter.

Question 3

A Choose the correct answer :

1. The following animals have no body support except ....
   a. worms. b. octopus. c. jellyfish. d. fish.
2. When atomic number of an element equals its mass number this means that there aren't .... in the nucleus of this element.
   a. electron b. protons c. neutrons d. photons
3. An object of 20 N. weight is placed at 5 m. height, it has potential energy ....
   a. 50 joule. b. 100 joule. c. 150 joule. d. 200 joule.
4. The number of atoms is equal to the number of elements in .... molecule.
   a. water b. hydrogen chloride c. oxygen d. ammonia gas

B Give one difference between :

1. Insects and arachnids.
2. Rodents and lagomorphs.

C Write down the electronic configuration of the following :

1. $^{23}_{11}Na$ 2. $^{1}_{1}H$ 3. $^{20}_{10}Ne$ 4. $^{40}_{20}Ca$

Question 4

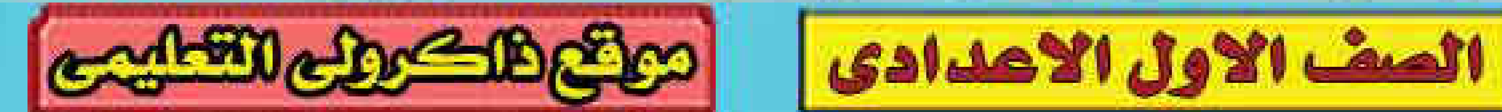
A What is meant by ... ?

1. The density of natural milk 1.03 gm/cm^3
2. Heat energy.

B Put (✓) or (✗), then correct the wrong ones :

1. In solar cells, the solar energy is converted into heat energy. ( )
2. The mass number is the number of protons and electrons. ( )
3. Angiosperms are called flowering plants. ( )
4. The motion of gaseous molecule is limited. ( )

C An object has kinetic energy 64 joule and is moving at velocity 4 m/s. Find the object mass.

24 Aswan Governorate — Science Inspectorate

Answer the following questions :

Question 1

A Complete the following statements :

1. The matter is composed of small units called ...., while these units are consisted of smaller units called ....
2. Frictions turns .... energy into .... energy.
3. .... and .... are teethless mammals.

B What is the different between ... ?

1. Element and compound.
2. Potential and kinetic energies of an object.

C What happens when ... ?

1. You open a perfume bottle in a closed room for a while.
2. Polar bear can't undergo hibernation.

Question 2

A Choose the correct answer :

1. Resource of permanent energy is ....
   a. petrol. b. the Sun. c. nuclear reactions. d. coal.
2. .... is from substances that float on water surface.
   a. Iron b. Copper c. Cork d. Aluminium
3. The example of living organism that undergoes hibernation is the ....
   a. desert snail. b. jerboa. c. frog. d. all the previous.
4. Heat transfer by radiation takes place through ....
   a. liquids only. b. gases only. c. material media and nonmaterial ones. d. metals only.

B Give reasons for the following :

1. Handles of cooking pans are made up of wood or plastic.
2. Solar heater is preferred to gas heater.

C Mention one example for :

1. An insectivorous plant.
2. A device that produces heat energy.
3. A very active metal.

Question 3

A Write the scientific term :

1. The basic classification unit for living organisms.
2. The mass of unit volume of the substances.
3. Sum of protons and neutrons in a nucleus.
4. The work done during the motion of an object.

B Write the electron configuration of the following :

1. $_{11}Na$ 2. $_{17}Cl$ 3. $_{12}Mg$ 4. $_{3}Li$

C Calculate the potential energy of an object its weight is 20 N., placed at 5 m height from the ground.

Question 4

A Put (✓) or (✗), then correct the wrong one :

1. The distance among solid molecules is very large. ( )
2. In car lamps, electric energy changes into light energy. ( )
3. The compound consists from a combination of atoms of one element. ( )
4. The bird activity during the day and the bat during night is from functional adaptation. ( )
5. Iron rusts when it is exposed to dry air. ( )
6. Melting point is the temperature at which the matter changes from solid phase into liquid one. ( )

B What is the importance of ... ?

1. The front teeth of hedgehog. 2. Long arms of monkey.

C Choose the odd word :

1. Oxygen – Nitrogen – Water – Chlorine
2. Lion – Tiger – Dog – Wolf – Armadillo
3. Hibernation – Extinction – Aestivation – Camouflage.
4. Petroleum – Wood – Cork – Iron

25 South Sinai Governorate — Tour Sinai Directorate

Answer the following questions :

Question 1

A Complete the following statements :

1. The chemical symbol of iron element is ...., while S is the chemical symbol for .... element.
2. The mechanical energy = ... + ...

3. Cockroaches is considered from ...., while scorpion is considered from ....
4. The horse foot ends with .... and this type of .... adaptation.
5. The water molecule consists of one atom from .... and two atoms from ....
6. Some solids are soft at ordinary temperature such as ...., while .... cannot be soften if is heated.

B Show the electronic configuration for the following atoms, then show which one is active and which one is inert :

1. $^{40}_{20}Ca$ 2. $^{4}_{2}He$ 3. $^{24}_{12}Mg$

C What is the meant by ... ?

1. The melting point of ice = zero degree celsius.
2. The kinetic energy of an object = 400 joule.

Question 2

A Correct the underlined word from the following :

1. The liquid element which its molecule consists of two atoms is **mercury**.
2. Transfer of heat by **conduction** does not need a material medium.
3. The relation $2n^2$ determines the number **of neutron** in energy level.
4. The networks of cellular phone cause **noise** pollution.
5. **Copper** rode is the negative pole in the simple electric cell.
6. The stored energy in battery car is **potential** energy.

B A metallic ball has 4 Kg mass launched upward to 6 m. hight, calculate the potential energy at maximum Height. Knowing that gravity acceleration = 10 m/s^2.

C Mention each of the following :

1. The way of heat transfer through amount of water.
2. The device which is used in examining of micro-organisms.
3. Edentates (teethless animal).
4. The reason which makes chameleon colours itself with the dominant colours of the environment.

D Determine the energy transformation in each of the following :

1. Electric lamp.   2. Electric generator (dynamo).

Question 3

A Write the scientific term for the following :

1. The simplest pure substance that could not analyzed into simpler form.
2. The number of positive protons inside the nucleus of the atom.

3. The fundamental unit for natural classifying system in living organisms.
4. The plants which can not distinguished into root, stem and leave.
5. A substance that its solution in benzene does not conduct electricity.
6. The energy which transfers from high temperature object to low temperature object.

B Compare between the following :

1. Rodents and lagomorphs according the number of incisors in each jaw.
2. Sodium element and gold according to chemical activity.

C A piece of iron has mass 78 grams and its volume 10 cm^3. Calculate its density ?

D Mention one example for the following :

1. Predacious plant.
2. A gas its molecule consists of two similar atoms.

Question 4

A Give reasons for the following :

1. "K" energy level is filled with electrons before "L" energy level.
2. The predatory birds have sharp and strong crocked beak.
3. Iron rod not copper are used in building houses concrete.
4. The atom is electrically neutral.
5. The electric heater is placed down on the ground of room.

B Choose the correct answer from the following :

1. A smell property is distinguishing factor between ....
   a. iron and copper. b. wood and plastic. c. perfume and vinegar.
2. From the animals that undergo aestivation is ....
   a. rat. b. jerboa. c. frog.
3. During festivals balloon is filled with .... gas.
   a. nitrogen b. hydrogen c. oxygen
4. The permanent source of energy is ....
   a. petroleum. b. electricity. c. the Sun.
5. From the plant that reproduce by forming spores ....
   a. pine. b. wheat. c. voughair.

C What would happen when ... ?

1. The horse and camel exchange their feet.
2. The electron requires a quantum of energy.

